ECONOMIC ANALYSIS OF THE LINER MARKET AND FREIGHT RATES IN CANADIAN INTERNATIONAL TRADES

by

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FOREWORD

This study provides an economic analysis of the liner shipping market and freight rates based on Canadian data. It presents important insights into the liner shipping industry in general and the conference system in particular. The report also provides an empirical analysis of the structure and level of conference tariffs and the impact of these freight charges on the final prices of major exports and imports in the Canada-Europe trades.

The study involves the use of statistical data analysis techniques and econometric models to test a number of theoretical hypotheses. These form an integral part of the study and are included in the body of the report for the benefit of readers wishing to examine in detail the approach which was used to arrive at the findings of this study. Consequently, parts of this report are of more iterest to readers with specialized training in econometrics or statistics.

Whenever possible, the Commission makes available to the public the results of its research endeavors and the present report is offered in line with this policy. The views expressed in this report, however, are those of the author and not necessarily those of the Canadian Transport Commission.

Yves Dube
Vice President (Research)

Canada

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The views and opinions expressed herein are those of the author, and not necessarily those of the Canadian Transport Commission, however the author takes full responsibility for any errors that may be contained in this report.

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Chapter 1

INTRODUCTION

This study involves an empirical analysis of the structure of the liner market and the level and structure of liner conference rates based on Canadian data. Specifically, statistical data analysis and econometric models are used to examine a set of economic issues and theoretical hypotheses related to the performance of the liner industry.

The liner market is dominated by self-regulated conferences whose main functions include setting liner rates, rationalizing capacity, and controlling competition. As such, the market power of the conference system, particularly the conference's price behaviour, has often been an issue of controversy among both economists and government legislators. A significant amount of literature has been published on theories concerning conference pricing. However, empirically, very little has been done to provide evidence on these theories.

In order to assess the behaviour of liner conferences, it is necessary to analyse the structure of the liner market; specifically, the degree of competition as well as the contestability. Moreover, the liner market has experienced drastic changes in recent years; therefore, it is important to examine the impact of these changes on the level and structure of conference rates.

Furthermore, an analysis of the impact of new developments in liner markets on the structure of the liner industry is greatly needed because changes in conference regulations are taking place in both Canada and the United States. In Canada, the Shipping Conference Exemption Act of 1979 (SCEA) is currently under review. A set of proposed changes to the Act, which was introduced to the Canadian Senate in early 1984, seems to suggest a strengthening of the SCEA. Conversely, in the United States, the new Shipping Act of 1984 allows a greater scope for co-operation and organization in liner shipping than its predecessor. Consequently, this study is useful in the evaluation of these new shipping acts.

Finally, because Canada relies mainly on foreign flag vessels in deep sea liner shipping, it is important to analyse the effect of liner rates on Canadian international trades. This study includes an analysis of liner rate indices on Canadian export routes, a comparison of the levels of inbound and outbound rates, and analyses of liner freight incidences and the elasticity of demand for liner transport in Canadian trades.

1.1 Objectives

The two main purposes of this study are to determine the structure of the liner industry and to examine the level and the structure of conference rates and their effect on Canadian international trades. Specifically, the objectives include assessing the following economic issues:

1) the degree of actual competition in the liner market;

2) the contestability (likelihood and impact of potential competition from new entrants) of the liner industry, notwithstanding the presence of the conference system;

3) the degree of price discrimination reflected in the conference rate structure;

4) the profitability of liner conferences;

5) the impact of the intermodal system on the structure of the liner market and the liner conference;

6) the demand and supply of liner services to and from Canada;

7) the impact of liner costs (rates) on Canadian international trades; and

8) the elasticity of demand for liner transport.

1.2 Data

Overall, the study analyses data obtained on Canadian liner trades for the period from 1973 to 1984. However, the data periods used in separate sections are somewhat different. For instance, the profitability analysis covers the period from 1973 to 1983; the liner freight rate indices run from 1978 to 1982; the rate structure models are constructed based on 1982 and 1983 data; and the changes in conference tariffs and new developments in liner markets are examined up to 1984.

The study uses the following four data sources:

1) conference tariffs filed with the Canadian Transport Commission;

2) shipping statistics compiled on computer tapes by Statistics Canada;

3) external trade statistics published by Statistics Canada (Exports Cat. 65-202 and Imports-Merchandise Trade Cat. 65-203); and

4) two stowage handbooks (one by R.H. Thomas and the other by J. Leeming).*

In addition, relevant data are obtained from published journals and reports, such as the International Container Year Book, Lloyd's Shipping Economist, Shipping Statistics (Bremen) and annual reports of liner companies etc.

1.3 Methodology

This study relies heavily on empirical analysis; specifically, the following quantitative methods are adopted:

1) A detailed traffic analysis which includes a breakdown of ocean cargo movement by service types (i.e., liner, non-liner, conference, non-conference), and by commodity types (bulk, neo-bulk, and containerized and non-containerized general cargos) is performed based on Canadian shipping statistics. The results of the analysis are used in the assessment of competition in the liner market and in the analysis of the demand for and supply of liner services in Canadian trades.

2) Liner rate structure models are developed to test theoretical hypotheses on conference pricing, such as the value-of-service pricing, the Ramsey optimal pricing, etc., and to examine the effect of a set of independent variables in the determination of liner commodity rates. Moreover, statistical tests of significance are used to examine differences between inbound and outbound rates.

3) Price indices are used to analyse liner rate increases by conferences serving Canadian export trades over the five-year period from 1978 to 1982. The incidences of liner freight rates are calculated for selected import and export commodities in major trade routes in order to measure the impact of liner costs on the final prices of commodities. The elasticity of demand for liner transport is evaluated on the basis of

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* See references 26 and 27.

the incidence of liner rates and the price elasticity of imports and exports.

4) Finally, observations from the tabulations and graphics of compiled data are used to draw conclusions in various sections.

Chapter 2

SUMMARY AND CONCLUSIONS

The liner market's tendency toward fierce competition was once again shown by the rate wars which took place recently on major liner trade routes such as the Transpacific, North Atlantic, and Europe-Far East routes in the early 1980's. These rate wars reaffirm that, in the absence of a strong and effective conference system, it is difficult to maintain rate stability in the liner industry.

A powerful conference which restricts entry and adopts uniform rate agreements has been regarded by many as a monopoly. Controversies have often arisen as to whether the conference exercises monopoly power to gain excess profit and whether it practises price discrimination in the liner market. Many observers take the position that a certain degree of conference regulation is necessary to offset the reduction in competition and prevent conferences from abusing their rate-setting powers.

However, while theoretical debates on the conference system continue, the liner market is in a state of flux and the structures of traditional conferences are changing. The three most important new developments which may affect the conference in the long run are summarized below:

(1) Since the container revolution in the late 1960's, the liner industry has undergone a number of major changes. These include changes in traditional cargo-handling methods, the transition from breakbulk vessels to container vessels, and more recently, the ocean carriers' expansion into multimodal services and the conferences' control over intermodal rates. All these developments affect the competitive nature of the liner markets and the power of the conference.

(2) As a result of the rate wars, two new trends have emerged in the conference system. One is the merger of conferences into a single super-conference, the other is the development of less restrictive rate agreements. In particular, on the U.S. Atlantic Coast, nine conferences which included seven North Atlantic and two South Atlantic conferences merged into two large groups known as the U.S. Atlantic-North Europe and the North Europe-U.S. Atlantic conferences in October 1984. The effects of the new conference on liner shipping between North America and Europe have yet to be assessed. About the same time, on the Transpacific route, the 61 year-old Pacific Westbound Conference (PWC) was formally dissolved on October 31, 1984. The

carriers serving the Transpacific trade are consolidating into a new super-conference called the Transpacific Westbound Rate Agreement (TPWRA). Since the main reason for the failure of PWC was its inability to respond quickly to the lower rates of outsiders, the new conference will allow more flexibility in the rate agreement, for example by allowing independent rate action by conference members.

(3) Two recent developments in conference regulation have had a significant impact on the international liner trade. One is the implementation of the United Nations Code of Conduct for Liner Conferences in October 1983, and the other is the movement for regulatory reform in the United States which has resulted in the new Shipping Act of 1984.

The Canadian SCEA, which is currently under review, should take into account these new developments in international liner shipping in order to establish an effective regulatory process that may ensure an efficient and low cost ocean transportation system in Canadian foreign trades.

Overall, the empirical analysis presented in this study may be helpful in assessing the structure of the conference and the liner market. The following are major conclusions and observations derived from the results of this study:

1) The liner market is highly competitive. Although the conference is able to control internal competition among conference members, it still has to compete with outsiders such as air transport, non-conference lines, tramps, and members of other conferences. Therefore, the conference must operate efficiently and minimize its costs in order to dominate the liner market.

2) The liner market is contestable even with the presence of the conference. The contestability is evidenced by the frequent entry and exit of carriers in liner markets, the mobility of liner vessels from one route to another, and the existence of chartered vessels. Thus, the threat of potential entrants could have been an "invisible hand" that prevented the conferences from making excess profits. The contestability of liner markets implies that in order to stabilize liner rates and avoid rate wars, the conference must practice entry deterrent pricing.

3) The intermodal system has had a great impact on the conference system. It has not only caused reforms of the traditional conference tariff but has also resulted in changes in the conference structure. As the landbridge and mini-bridge

concepts have redefined the geographical area covered by a conference, interconference competition has intensified. On the other hand, in an attempt to avoid competition, affected conferences have started to merge into one large ratemaking conference.

4) An empirical analysis of the structure of conference rates indicates that the significance of value-of-service pricing was greatly reduced in the 1982-1983 period when severe rate wars between conference and non-conference carriers occured. Generally speaking, conference commodity rates are still positively correlated with the unit values of commodities. However, the unit value no longer stands out as a major explanatory variable for the variation in commodity rates.

5) During the rate war period, the average cost of transport as well as individual commodity handling costs appeared to be the most significant explanatory variables for rates.

6) The rate reforms of the four conferences serving Canada-North Europe routes have changed the traditional weight/measurement rate base to the lump sum container commodity box rate system. However, the rate reforms do not reduce commodity classes. In fact, the conference tariffs become more complicated because of the separate rates for 20 and 40 foot containers and the increased number of door-to-door rates.

7) The analysis of the rate structure model shows that the rate reforms of the North Atlantic conferences have not changed the structure of conference rates. Specifically, the commodity box rate is based on the average weight of a commodity per container and the liner rate per unit of weight of the commodity.

8) A case study of one firm indicates that liner profitability fluctuates from year-to-year. There is a lack of evidence of consistently high profits; although, generally speaking, conference lines had good performances during the 1970's.

9) In terms of rate levels, non-conference rates are generally lower than conference rates. However, some of these rates proved to be unsustainable because they were unremunerative. Moreover, the minimum rates of the North Atlantic conferences were found to be very close to the estimated

average cost on a per 20 foot equivalent unit (TEU) basis.

10) The liner price index shows that conferences implemented drastic rate increases in the late 1970's mainly in the forms of bunker and currency surcharges. However, the rates on major liner routes were depressed by 1982.

11) In Canada-U.K. and Canada-Continental Europe trades, inbound rates were found to be significantly higher than the outbound rates. However, this is due mainly to the differences in the demand and supply of vessel space and in the traffic mix between the inbound and outbound legs. In fact, on the same routes, the rate incidences on final prices of commodities (freight/value ratios) are found to be lower for inbound than for outbound cargos.

12) On average, in 1980 for Canadian export trades, the liner transport cost represents about 16% of the unit value of a commodity at the port of destination; the average liner rate incidence on commodities exported from the East Coast is 12% and from the West Coast, 23%. These results are based on selected export commodities on 17 trade routes.

13) Although the rate stucture models which are based on 1982-1983 data fail to present strong evidence on conference "value-of-service pricing", cases of value-of-service pricing can be found in 1980 data. As shown in the analysis of liner freight incidence (Section 8.3), in some commodity groups, high and low-value commodities have the same freight incidence, which means the former pays a higher freight rate.

14) Finally, in Canadian trades, changes in liner rates induce little change in the demand for liner services. In other words, the demand for liner services is inelastic.

Chapter 3

THE MARKET STRUCTURE OF THE LINER INDUSTRY

The purpose of this chapter is to empirically examine the degree of competition in Canadian liner trades.

The chapter contains three main sections. The first is an overview of the demand for and the supply of ocean transportation in Canadian foreign trades. The second is an analysis of competition between conference and other transportation services, which include the air mode, tramp shipping, non-conference lines, and other conferences. The third is a discussion of the effects of the intermodal system on the structure of the liner market.

3.1 An Overview of the Demand and Supply of Liner Services in Canada

The liner shipping industry provides regular services for the movement of general cargo on overseas international trade routes. Liner services operate regularly on fixed sailing schedules and frequencies between specified ports or routes. The sailing dates and ports of call are usually advertised in advance, and the service is available to both large and small shipments. However, liners are not the only water transport for the movement of general cargo; there is an alternative service known as tramp.

The tramp vessel is operated on a time or trip-chartered basis, therefore it does not have a regular schedule and route. It may also carry bulk freight one way and general cargo on the return leg. Tramp rates are determined in free, competitive markets. Conversely, liner rates are, by and large, established by shipping conferences.

As the liner shipping conference usually includes the majority of the lines in a given market, the non-conference lines are often referred to as "independents" or "outsiders" in the liner market. Nevertheless, Canadian liner trades are served by both conference and non-conference lines, and the latter has gained much importance in recent years.

Table 3.1 presents total inbound and outbound cargo tonnages handled in Canadian ports (except cargo to and from the United States) by commodity and service types in 1982. Commodities are grouped into five categories, namely, dry bulk, liquid bulk, neo-bulk, containerized general cargo, and other general cargos. Shipping services are grouped into three types: non-liner, conference, and non-conference lines.

Several findings derived from Table 3.1 are summarized below:

1) Overall, a little more than 12% of the total tonnage handled in Canadian ports is classified as general cargo. If neo-bulk, such as cars, tractors, lumber, and newsprint paper, etc., are included, the general cargo component or the main liner market represents about 17% of ocean freight tonnages in Canadian trade.

2) In the bulk market, a total of 98 million tonnes was moved in 1982. Non-liners, which include bulk carriers, tankers, and tramps, moved 94% of the total volume of dry and liquid bulks. Only 6% of the total bulk trade was carried by liners. Liners usually carry the bulk below deck in order to stabilize the vessel and to earn extra revenues by filling ships when excess capacity is available.

3) Neo-bulk products are high-value commodities carried by both liners and non-liners. A list of neo-bulk and bulk commodities is provided in Appendix A. The majority of neo-bulks are moved by special chartered vessels. However, liners also participate in this trade, carrying 28% of the total neo-bulk cargo in 1982. This is particularly true of the non-conference lines whose container-bulk vessels are able to compete in bulk markets more effectively than conference lines who concentrate mainly on containerized cargos.

4) Total liner cargo tonnage was about 14.4 million tonnes in 1982. This represented 12.2% of the total waterborne cargo tonnages in Canada's international trades for 1982. Liners are mainly general cargo carriers.

5) Liner conferences are the major carriers of containerized cargo. However, they are no longer in a monopoly position in regard to container movements. As non-conference lines carried 32% of total containerized cargo, and non-liners took a share of 6%, conference lines only maintained a 62% share of the container market.

6) While conference lines concentrate on the container market, non-conference lines have become the main suppliers of liner service for the movement of non-containerized general cargos. Specifically in 1982 the non-conference lines carried 77% of the non-containerized liner cargo, compared to 23% by conference lines.

Table 3.1

TOTAL CARGO TONNAGES LOADED
AND UNLOADED IN CANADIAN PORTS
(EXCEPT CANADA-U.S. TRADES)
BY SERVICE AND COMMODITY TYPES 1982
(Metric Tons)

	COMMODITY TYPE LOADED							
Outbound	Dry Bulk	Liquid Bulk	Sub-Total Bulk	Neo-Bulk	Containerized	Others General	Sub-Total General	Total
Non-Liner	76 560 503	767 522	77 328 025	3 770 334	259 707	6 008 746	6 268 453	87 366 812
Liner Non-Conference	3 693 613	29 727	3 723 340	1 141 562	1 110 786	772 448	1 883 235	6 748 137
Liner Conference	1 733 652	2 159	1 735 811	265 272	2 139 187	196 703	2 335 890	4 336 973
Total	81 987 768	799 408	82 787 176	5 177 168	3 509 681	6 977 897	10 487 578	98 451 922
Inbound								
Non-Liner	5 021 563	9 734 672	14 756 235	199 879	120 896	1 038 666	1 159 562	16 115 676
Liner Non-Conference	273 649	168 174	441 823	40 496	814 918	204 735	1 019 653	1 501 972
Liner Conference	49 330	16 454	65 784	63 875	1 580 646	90 003	1 670 648	1 800 308
Total	5 344 542	9 919 300	15 263 842	304 250	2 516 460	1 333 404	3 849 864	19 417 956
Total								
Non-Liner	81 582 065	10 502 194	92 084 260	3 970 213	380 603	7 047 412	7 428 016	103 482 488
Liner Non-Conference	3 967 262	197 901	4 165 163	1 182 058	1 925 705	977 183	2 902 888	8 250 109
Liner Conference	1 782 983	18 613	1 801 595	329 147	3 719 833	286 706	4 006 539	6 137 281
Total	87 332 310	10 718 708	98 051 018	5 481 418	6 026 141	8 311 301	14 337 442	117 869 878
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)

Note: (3) = (1) + (2); (7) = (5) + (6); (8) = (3) + (4) + (7)

Source: Based on shipping data on computer tapes provided by Statistics Canada.

In order to obtain a better view of the historical roles of conference and non-conference lines in Canadian trades, the liner cargo tonnages carried by both types of lines are analysed based on data for the period from 1977 to 1982. Table 3.2 shows the demand for and the supply of liner services in import and export trades by conference and non-conference lines for the past five years (1981 data were not processed and therefore are not included). As shown in the table, a total of about 12 million tonnes of liner cargos was handled in 1977. Between 1977 and 1979, the liner cargo tonnage had increased by a total of 26.5%, with an annual growth rate of 13.8% and 11.2% in 1978 and 1979, respectively. The growth, however, slowed down and even became negative in the early 1980's as a result of the worldwide recession. The liner cargo loaded and unloaded in Canada in 1982 was 14 387 390 metric tons, which was 3% less than in 1980.

For inbound traffic, the conferences' share of liner cargo declined drastically from 77% in 1977 to 55% in 1982. Compared with the inbound traffic, conference lines faced even more competition from the non-conference lines in the outbound market. During the study period, the share of conference lines in total outbound liner cargos declined from 62% to a mere 39%. In total Canadian trades, the shares between conference and non-conference lines were 69% and 31%, respectively, in 1977; the shares had nearly reversed in 1982 when the conferences' share dropped to 43%, and the non-conference lines' share increased to 57%.

The supply of liner services to Canada is further analysed in Table 3.3 which shows the number of lines participating in Canadian liner trades by conference membership as well as by the East and the West Coasts. At the beginning of 1983, a total of 86 lines operated in the Canadian market; 65 of these lines served the East Coast, and 38 served the West Coast. Although, overall, the conference lines were still in the majority, from 1980 to 1983 they faced the greatest challenge from independents in liner history. In early 1983, the conference lines were outnumbered by the non-conference lines by a margin of one on the East Coast. However, the situation has reversed since the beginning of 1984, with Cast (1983) and Sea-Land joining the conferences on the North Atlantic routes.

However, conference lines generally have longer periods of service than independents. As shown in Table 3.3, of the 39 non-conference lines serving Canadian ports in 1983, only nine of them had offered continuous service since 1975. The rates of new entry as well as the rates of withdrawal from the liner market of non-conference lines are much higher than those of conference lines. Consequently, it cannot be denied that the conference system contributes to the stability of the liner industry.

Table 3.2

THE DEMAND FOR LINER SERVICES
IN CANADIAN OVERSEAS TRADE 1977-1982
(Metric Tons)

	1977	%	1978	%	1979	%	1980	%	1982	%
Inbound										
Conference	2 555 904	77	2 504 547	64	2 489 503	69	1 831 562	48	1 800 308	55
Non-Conference	764 996	23	1 394 667	36	1 123 506	31	1 964 452	52	1 501 972	45
Total Liner	3 320 900	100	3 899 214	100	3 613 009	100	3 796 014	100	3 302 280	100
Outbound										
Conference	5 494 947	62	5 464 723	58	5 132 897	46	4 343 953	41	4 336 973	39
Non-Conference	3 368 934	38	3 946 411	42	6 048 018	54	6 366 419	59	6 748 137	61
Total Liner	8 863 881	100	9 411 134	100	11 180 915	100	10 710 372	100	11 085 110	100
Total Trade										
Conference	8 050 851	69	7 969 270	60	7 622 401	52	6 175 514	43	6 137 281	43
Non-Conference	3 644 050	31	5 341 077	40	7 171 524	48	8 330 872	57	8 250 109	57
Total Liner	11 694 901	100	13 310 347	100	14 793 925	100	14 506 386	100	14 387 390	100

Source: Based on shipping data on computer tapes provided by Statistics Canada.

Table 3.3

NUMBER OF LINES IN CANADIAN LINER TRADES

	Lines Calling East Coast			Lines Calling West Coast			Canada Total		
	Conf.	Non-Conf.	Total	Conf.	Non-Conf.	Total	Conf.	Non-Conf.	Total
Lines Calling (Beginning of 1983)	32	33	65	30	8	38	47	39	86
Lines in Continuous Service since 1975	27	8	35	25	2	27	39	9	48
New Entrants (1977-1982)	8	42	50	6	7	13	12	48	60
Lines Withdrawing (1977-1982)	12	23	35	11	4	15	22	27	49

Note: Some of the lines operate on both the East and the West Coasts. Therefore, the total number of lines is not the sum of the East Coast and West Coast lines.

Source: Canadian Transport Commission. The Supply of Liner Shipping in Canada, Research Report No. 1984/03, June 1983.

In recent years, the liner shipping and particularly the container shipping industry has been depressed as a result of overcapacity. On a world basis, the supply of container slots is already 20 to 25% in excess of cargo volume.[1] The reasons for the overcapacity problem are manifold. In the early 1980's, reductions in the price of vessels, due to the recession in the world shipbuilding industry, created a buying spree among shipping operators. Both conference lines and outsiders tried to take advantage of low-cost vessels and expanded their fleets despite the existing overcapacity. The availability of subsidized credit and/or direct subsidies also encouraged ship owners in some maritime nations to obtain new ships. The recession in the world economy caused reductions in international trades and consequently overtonnaging in ocean transportation. Finally, the excess capacity is partly caused by a high volume of cargo in one direction on unbalanced trade routes.

In Canadian liner markets, the overcapacity problem is most serious on the Transpacific and North Atlantic routes. The Transpacific route is served mainly by joint conferences which operate on both Canadian and U.S. coasts. Therefore, it is difficult to assess the vessel capacity reserved for Canadian cargo. Consequently, an analysis of load factors of container vessels and TEU capacities is performed on the North Atlantic route only.

Table 3.4 shows the estimated inbound and outbound load factors of a major line operated on the Canadian North Atlantic route in 1982. As shown in the table, only in rare cases do the inbound and outbound trips have the same level of load factors. Generally speaking, the table reflects unbalanced trade; during part of the year, the load factors of inbound vessels were higher than those outbound in most trips, while at other times, more excess capacity was found in inbound vessels. However, even in the same direction, the load factors of container vessels fluctuate from one trip to the other throughout the year. This is depicted graphically in Figure 3.1.

The fluctuation in demand is one of the reasons for over capacity in the liner service. As shown in Table 3.4, on some trips the vessels are fully loaded or close to full capacity, while on other trips the vessels are less than half-loaded.

Table 3.4

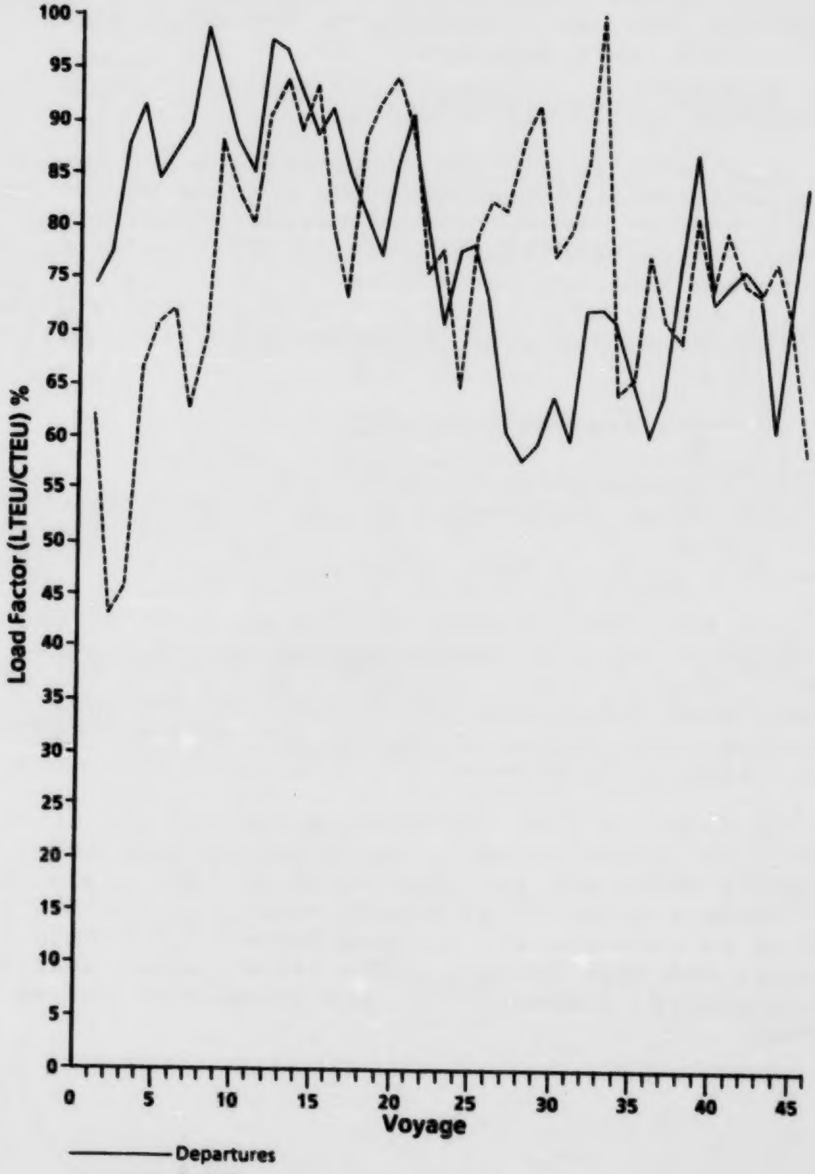
ESTIMATED LOAD FACTORS ON THE NORTH ATLANTIC ROUTE 1982

(100 X Loaded TEU/Capacity TEU)

Arrival		Departure	
Voyage	Load Factors %	Voyage	Load Factors %
1	62.0	1	73.9
2	43.3	2	77.0
3	46.0	3	87.5
4	66.2	4	91.6
5	70.4	5	84.2
6	72.4	6	86.8
7	62.6	7	89.9
8	70.4	8	99.2
9	87.7	9	92.9
10	83.6	10	87.3
11	80.0	11	85.3
12	89.8	12	97.9
13	93.5	13	96.8
14	88.5	14	92.5
15	93.6	15	88.6
16	78.3	16	91.4
17	72.9	17	85.6
18	88.5	18	81.7
19	92.0	19	76.7
20	94.3	20	84.9
21	87.4	21	90.3
22	75.9	22	80.0
23	78.1	23	70.6
24	63.7	24	77.5
25	79.2	25	78.1
26	82.3	26	72.4
27	81.7	27	60.5
28	88.4	28	57.6
29	91.8	29	59.0
30	77.0	30	64.0
31	79.8	31	59.0
32	86.0	32	72.2
33	100.0	33	72.2
34	64.2	34	70.6
35	65.4	35	65.4
36	77.7	36	59.3
37	70.6	37	63.9
38	68.8	38	77.6
39	80.8	39	86.9
40	73.9	40	72.3
41	79.3	41	74.5
42	74.0	42	76.2
43	73.4	43	74.1
44	76.3	44	60.3
45	69.4	45	72.7
46	57.9	46	84.0

Source: Based on shipping data on computer tapes provided by Statistics Canada.

Figure 3.1
LINER LOAD FACTORS ON THE NORTH ATLANTIC ROUTE



Furthermore, the annual TEU capacity supplied by conference and non-conference carriers between Canada and North Europe in 1983 and 1984 are shown in Tables 3.5 and 3.6, respectively. A comparison of the annual TEU capacity between the two years shows an increase of about 28% in 1984 over 1983. This is caused mainly by the entrance of Sea-Land on the Canada-North Atlantic route. However, the conference's position was strengthened in 1984, as it had 85% of the total slots supplied by liners on this route compared to 59% in 1983.

3.2 Competition in the Liner Market

By eliminating internal competition between conference lines, the conference is considered by some as having the market power of a monopoly. Nevertheless, based on historical and recent events which have taken place in liner markets, it is not hard to conclude that the conference is still subject to competition from various external sources. This section analyses four major competitors of shipping conferences in liner markets. They are:

1) air freight transport;
2) tramps;
3) non-conference lines; and
4) other conferences on adjoining routes.

3.2.1 The Role of Air Transport

In 1977, the air mode carried about 6% of the total value of Canadian exports, excluding the United States. In the early 1980's, the air share of total export value had increased to 8%. This share increased particularly on the Canada to Western Europe trade route, where the air mode carried 13% of exports in terms of value.

In order to identify areas where air and liner modes are competitive, export commodities moved by both modes on the North Atlantic route are analysed based on 1981 trade data. Table 3.7 shows a total of 47 export commodity classes (XCC) that were carried by both the air and sea modes from Canada to the U.K., France, and West Germany. The value market shares of air and sea transports, respectively, are calculated for each commodity group.

Table 3.5

ANNUAL TEU CAPACITY SUPPLIED
BY CONFERENCE AND NON-CONFERENCE CARRIERS
BETWEEN CANADA AND NORTH EUROPE/U.K.
1983

Carrier	Vessel Type	Frequency	Port Range	Annual TEU Capacity Westbound	Annual TEU Capacity Eastbound	
Conference						
ACL A	RC	Weekly	USNA, CANEC/NEUR,U.K.	43 940	43 940	
ACL B	RC	Weekly	USNA,CANEC/NEUR,SCAN	53 248	53 248	
SLCS	FC	Weekly	STLAW/NEUR,U.K.	96 304	96 304	
HAPAG-LLOYD	FC	Weekly	CANEC,USNA/NEUR,U.K.	91 416	91 416	
Non-Conference						
ARTIC	RR	14 days	STLAW/NEUR	11 440	11 440	
BALT CANADA	RR	21 days	STLAW,CANEC/NEUR	2 610	2 610	
FALLINE	BC	2/month (season)	GTLAK,STLAW/NEUR	6 080	6 080	
POL	RC	Weekly	CANEC,USNA-SA/NEUR	73 684	73 684	
SOFATI	FC	8 days	STLAW/NEUR,U.K.	26 775	26 775	
CAST	BC	Weekly	STLAW/NEUR,U.K.	76 231	76 231	
Total Conference Capacity				284 908	284 908	59%
Total Non-Conference Capacity				196 820	196 820	41%
Total Capacity				481 728	481 728	100%

Source: *Containerisation International*, 1983.

Notes: (1) RC = Ro-Ro/Cellular; FC = Fully Cellular; RR = Ro-Ro; BC = Bulk/Container carriers.

(2) USNA = U.S. North Atlantic; CANEC = Canadian East Coast; NEUR = North Europe; STLAW = St. Lawrence.

Table 3.6

ANNUAL TEU CAPACITY SUPPLIED BY CONFERENCE AND NON-CONFERENCE CARRIERS BETWEEN CANADA AND NORTH EUROPE/U.K. 1984

Carrier	Vessel Type	Vessel Size Range TEU	Frequency	Port Range	Annual TEU Capacity		
					Eastbound	Westbound	
Conference							
ACL A	RC	2 157	Weekly	USNA,CANEC/NEU,U.K.,SCAN	112 164	112 164*	
ACL B	RC	1 025	Weekly	USNA,CANEC/NEUR,U.K.,SCAN	53 248	53 248	
Canada Lines	FC	1 800/1 852	Weekly	STLAW/NEUR,U.K.	66 921	66 921	
CAST (1983)	BC	1 466	Weekly	STLAW/NEUR,U.K.	76 236	76 236	
Hapag-Lloyd	FC	951	Weekly	USNA,CANEC/NEUR,U.K.	91 416	91 416	
ML	FC	1 800/1 852	Weekly	STLAW/NEUR,U.K.	28 680	28 680	
Sea Land	FC	1 794	Weekly	USNA,CANEC/NEUR,U.K.	93 288	93 288	
Non-Conference							
Artic	BC & RR	450	Twice monthly	STLAW/NEUR	10 800	10 800	
POL	RC	1 417	Weekly	USSA-NA,CANEC/NEUR	73 684	73 684	
CANSTATE	FC	150	Twice monthly	STLAW/EIRE,U.K.	3 600	3 600	
FALLINE	BC	250/300	2/monthly in season	GTLAKES,STLAW/NEUR	5 400	5 400	
Total Conference Capacity					521 953	521 953	85%
Total Non-Conference Capacity					93 484	93 484	15%
Total Capacity					615 437	615 437	100%

Source: Containerisation International, April 1984.

Notes (1) RC = Ro-Ro/Cellular; FC = Fully Cellular; RR = Ro-Ro; BC = Bulk/Container carriers.

(2) USNA = U.S. North Atlantic; CANEC = Canadian East Coast; NEUR = North Europe; STLAW = St. Lawrence.

(3) * In 1984, five 845 TEU G2s were replaced by five 2 157 TEU G3s on ACL Service A. The A route was extended to include Gothenburg as the port of call.

Table 3.7

VALUE MARKET SHARES FOR AIR AND SEA MODES BY SELECTED COMMODITIES IN CANADIAN EXPORT TRADES WITH FRANCE, U.K., AND WEST GERMANY

(1981 Data)

		Export Values in Thousands of Dollars						Total Values		Value Market Shares	
		France		W. Germany		U.K.				Percentage(%)	
XCC	Commodities	Air	Sea	Air	Sea	Air	Sea	Air	Sea	Air	Sea
091	Vegetables, fresh or chilled	4	13	24	161	-	261	28	435	6.1	93.9
011	Meat, fresh or frozen	22 418	1 293	1	362	5	4 128	22 424	5 783	79.5	20.5
104	Sugar, candy	1	6	1	309	6	1 490	8	1 805	0.4	99.6
146	Other foods	1	306	6	332	25	1 588	32	2 226	1.4	98.6
183	Tobacco	3	25	27	502	45	517	75	1 044	6.7	93.3
202	Fur skins, undressed	5 954	20	14 047	1 123	14 171	3 226	34 172	4 369	88.7	11.3
256	Precious metals in ores	223	483	2 596	6 826	127 575	34 697	130 394	42 006	75.6	24.4
310	Furs, dressed and fabricated	198	16	2 897	164	849	31	3 944	211	94.9	5.1
375	Man-made fibre, woven	37	29	87	21	45	2 031	169	2 081	7.5	92.5
381	Special construction fabrics	170	202	280	432	2 246	954	2 696	1 588	62.9	37.1
400	Chemical elements	85	1 092	85	3 750	251	5 164	421	10 006	4.0	96.0
429	Industrial chemical explosives	20	762	26	5 848	40	2 521	86	9,131	0.9	99.1
451	Aluminum, including alloys	1 782	363	2 479	891	3 807	2 080	8 068	5 061	61.5	38.5
452	Copper and alloys	31	87 733	1	69 237	43	157 206	75	314 176	0.0	100.0
465	Bolts, nuts, basic hardware	28	846	146	498	959	3 810	1 133	5 154	18.0	82.0
467	Welding wire rods	14	83	17	633	1	169	32	885	3.5	96.5
468	Valves and pipe fittings	161	3 384	420	1 021	496	3 133	1 077	7 538	12.5	87.5
469	Other metal fabricated prod.	291	879	124	498	189	2 092	604	3 469	14.8	85.2
496	Other fabricated materials	6	4	17	6	144	323	167	333	33.4	66.6
502	Engines and turbines	93	69	118	134	1 729	1 142	1 940	1 345	59.1	40.9
503	Electronic generators	33	456	116	230	308	691	457	1 377	24.9	75.1
504	Mech. power transm. equip.	37	311	413	3 854	250	935	700	5 100	12.1	87.9
507	Compressors, blowers	24	315	6	264	377	672	407	1 251	24.5	75.5
508	Pumps	100	177	163	628	279	511	542	1 316	29.2	70.8
509	Other general purpose industrial machinery	553	427	786	1 084	1 649	1 602	2 988	3 113	49.0	51.0
513	Hoisting machinery	47	9	106	610	106	2 715	259	3 334	7.2	92.8
519	Other material handling equipment	265	1 299	13	441	56	594	334	2 334	12.5	87.5
521	Drilling, mining, oil and gas machinery	1 318	825	543	4 408	2 213	10 853	4 074	16 086	20.2	79.8
522	Construction maintenance equipment	134	1 283	134	2 592	313	4 901	581	8 776	6.2	93.8
523	Metal working machinery	491	1 341	926	4 566	1 685	2 101	3 102	7 998	27.9	72.1
524	Wood working machinery	95	3 144	124	2 921	76	1 162	295	7 227	3.9	96.1
589	Motor veh. parts and acc.	684	2 460	740	15 204	1 370	6 266	2 796	23 930	10.5	89.5

Table 3.7 cont'd.

		Export Values in Thousands of Dollars						Total Values		Value Market Shares	
		France		W. Germany		U.K.				Percentage(%)	
XCC	Commodities	Air	Sea	Air	Sea	Air	Sea	Air	Sea	Air	Sea
593	Sub-assembly, pts. attach. for ships	179	179	79	589	351	725	609	1 493	29.0	71.0
605	Aircraft assemblies equip. and parts	13 637	6	5 120	188	17 614	432	36 371	626	98.3	1.7
634	Commercial telecom. equip.	2 712	153	5 417	2 795	23 555	3 625	31 684	6 573	82.8	17.2
637	T.V., radio and phonographs	140	176	1 530	223	13 338	8 218	15 008	8 617	63.5	36.5
638	Electric tubes	905	10 902	1 832	6 305	3 753	1 439	6 490	18 646	25.8	74.2
681	Lamps, light fixtures	11	555	56	823	65	2 409	132	3 787	3.4	96.6
685	Transformers	129	53	94	3 261	168	899	391	4 213	8.5	91.5
693	Batteries and parts	3	96	18	4 962	124	446	145	5 504	2.7	97.3
791	Boots and shoes	229	56	1 538	415	115	922	1 882	1 393	57.5	42.5
785	Hosiery	-	-	5	12	22	133	27	145	15.7	84.3
871	Biological products	7 230	70	885	35	138	225	8 253	330	96.1	3.9
883	Medical and pharm. esp. prods.	683	275	630	172	-	-	1 313	447	74.6	25.4
895	Other printed matters	399	215	421	314	1 889	695	2 709	1 224	68.9	31.1
905	Other stationery and office equipment	19	105	37	394	184	756	240	1 255	16.1	83.9
950	Containers and closures	37	419	133	641	297	2 980	467	4 040	10.4	89.6

Source: Statistics Canada, Exports-Merchandise Trade, Catalogue No. 65-202.

As shown in Table 3.7, air freight generally has higher unit values than liner cargos. For instance, "meat, fresh or frozen" was predominately moved by air transport while "vegetables, fresh or chilled" were predominately carried by the sea mode.

Based on the criterion that each mode carries at least 25% of the cargo movement in terms of value, the air and the liner modes are highly competitive with regard to the following 15 commodity groups:

1) special construction fabrics;
2) aluminum, including alloys;
3) other fabricated materials;
4) engines and turbines;
5) electronic generators;
6) compressors, blowers;
7) pumps;
8) other general purpose industrial machinery;
9) metal working machinery;
10) parts, attachments for ships;
11) T.V., radio, and phonographs;
12) electric tubes;
13) boots and shoes;
14) medical and pharmatical products; and
15) printed materials.

Recently, several studies of air cargo demand and market penetration have adopted the total distribution cost concept in the analysis of modal choice.[2], [3] Briefly, three important points related to the evaluation of the total distribution cost are raised. First, the faster air service permits savings in time-related costs, such as capital in transit and in stock. Second, the shorter transit time involves less risk (e.g., damage, perishability, obsolescence, etc.) and hence lower insurance costs for the air mode. Finally, the airports are often closer to final cargo destination than the seaports, thus, the air transport incurs less inland transportation costs. Consequently, for high-value commodities, the higher air freight rates may be offset by savings in capital, insurance, and other distribution costs.

However, although in recent years the air mode has increased its share of high-value traffic, it is unlikely that competition from air freight carriers would be a major threat to the liner business in the foreseeable future mainly because of the limited capacity of the air freight carriers and the high cost of air transport.

3.2.2 Competition from Tramps

Tramps, which are trip or time-charter vessel operators, present a constant threat to the liner industry.

Although tramps concentrate mainly on the larger shipments of bulk and non-containerized general cargos, they also pick up "normal" high-value liner cargos where and when they can profitably compete.

The tramp usually provides service for shippers who can fill a vessel. Thus, it charges a whole ship rate; the tramp rate is based on dollars per deadweight tonnage per month. Although tramp rates are generally lower than liner rates, the latter are more stable. The tramp and liner price indices published in Shipping Statistics by the Institute of Shipping Economics, Bremen[4] show that tramp rates fluctuate almost weekly while significant changes in liner rates generally only occur every six months.

The liner is able to compete with the tramp by providing better quality of service in terms of regularity, availability, and reliability. Moreover, the liner conferences use loyalty contracts and open rates to deter tramp competition. Conferences usually offer discount rates to shippers who agree to ship all or a given percentage of their cargo with the member lines. Open rates are usually quoted on commodities which are subject to tramp competition, such as wood pulp, newsprint paper, and lumber, etc. Under the policy of open rates, conference lines are free to make independent rate adjustments in response to competition from tramps or non-conference lines.

The extent to which tramps can compete with liners in ocean general cargo movements is analysed on the basis of data on the East Canada-North Atlantic and the West Coast Canada-Far East trade routes where a breakdown of general cargos carried by non-liner, liner conference, and liner non-conference carrier, respectively, in 1982 is available. Table 3.8 shows liner and non-liner general cargo traffic on these routes.

It can be seen from the table that containerization has a great impact on the liner trade, especially on the market share of the conference. On the North Atlantic route where 76% of total general cargo is containerized, liners carried a total of 83% of the total volume, of which 74% was containerized and 9% was non-containerized cargo. In the 17% tramp share of total general cargo, only 2% was containerized. Conversely, on the Transpacific route where only a little more than one-fifth of the total general cargo between Canadian and Far East ports was containerized, the liner share of total tonnage was merely 29%, although liners carried 20% out of the 21% of total cargo that was containerized. Therefore, non-liner carriers played a very important role on the Canada-Far East route. This is also illustrated graphically in Figure 3.2.

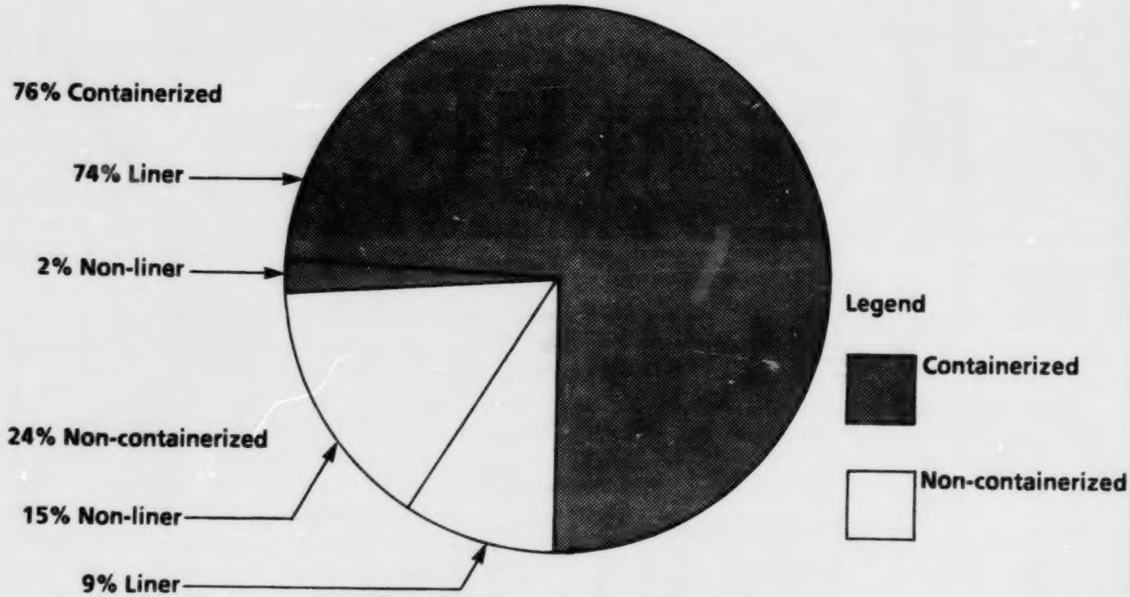
Table 3.8

LINER/NON-LINER GENERAL CARGO TRAFFIC 1982
(Metric Tons)

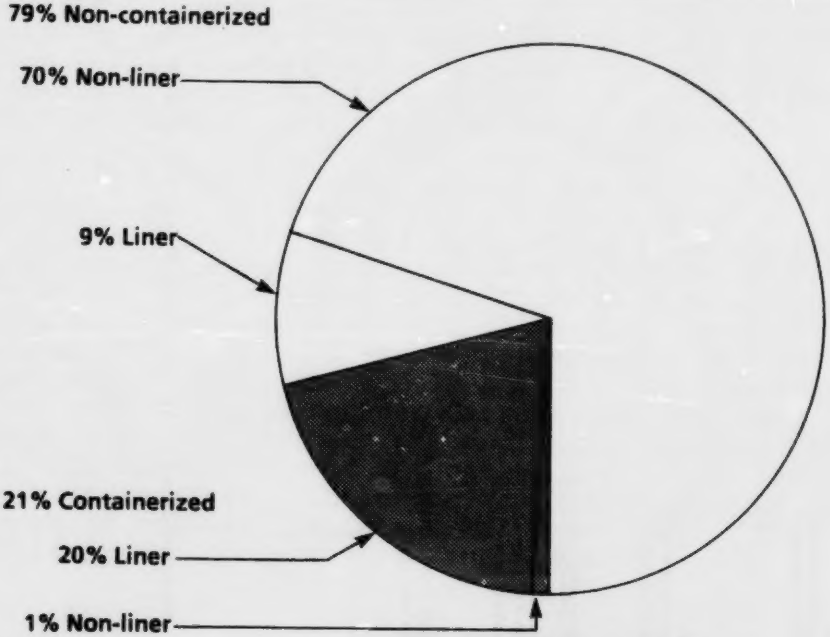
	East Canada/North Atlantic Routes			Canada West Coast/Far East Routes		
	Containerized	Non-Containerized	Total General Cargo	Containerized	Non-Containerized	Total General Cargo
Outbound						
Non Liner	43 246	490 663	533 909	14 781	1 276 776	1 291 557
Liner Non-Conference	501 580	266 832	768 412	63 587	119 890	183 476
Liner Conference	1 305 996	12 820	1 318 816	241 485	53 901	295 386
Total	1 850 822	770 315	2 621 136	319 853	1 450 567	1 770 420
Inbound						
Non Liner	28 263	188 141	216 403	9 271	293 627	302 898
Liner Non-Conference	401 172	107 174	508 346	24 006	13 408	37 415
Liner Conference	1 094 521	6 600	1 101 122	113 753	20 826	134 579
Total	1 523 956	301 915	1 825 871	147 031	327 861	474 892
Total Outbound/Inbound						
Non Liner	71 508	678 804	750 313	24 053	1 570 403	1 594 455
Liner Non-Conference	902 752	374 006	1 276 758	87 593	133 298	220 891
Liner Conference	2 400 518	19 419	2 419 937	355 238	74 728	429 966
Total	3 374 778	1 072 229	4 447 008	466 884	1 778 428	2 245 312
Percentage Containerized/ Non-Containerized	76%	24%	100%	21%	79%	100%

Source: Shipping data on computer tapes provided by Statistics Canada.

Figure 3.2
LINER / NON-LINER GENERAL CARGO TRAFFIC 1982



Canada East Coast / North Atlantic
Total General Cargo = 4 447 008 tonnes



Canada West Coast / Far East
Total General Cargo = 2 245 312 tonnes

However, it should be noted that more than 50% of the containers moved in the Canada-Far East trades were exported through the U.S. West Coast ports, presumably by liners. Consequently, the liners' share of Canadian imports and exports on the Pacific route is somewhat understated in Table 3.8. The issue of cargo diversion is discussed further in Section 3.2.4 on interconference competition.

Furthermore, when the line name was not provided in the shipping record, the record was automatically classified as non-liner. This potential recording error may result in an over estimation of non-liners' share of total general cargo. However, the A6 vessel records were verified by Statistics Canada, and the percentage of error is presumably small.

The non-liners were able to obtain large shares of the non-containerized general cargo market mainly because of the following reasons:

1) Some major conference lines, such as St. Lawrence Coordinator Service (SLCS), have replaced the traditional con-bulkers with fully cellular vessels which move only containerized cargos.

2) Although conference liners also accept non-containerized cargos, the conference's pier-to-pier rates for these cargos are much higher than tramp rates because of the costs incurred by the conference lines in packing and stuffing these breakbulk cargos into containers. As a consequence, tramps have become a major transporter of non-containerized general cargos.

3) Bulk carriers carrying containers may also present a great threat to the conference system. Since the decks of conventional bulk vessels are easily convertible to container slots, bulk carriers have competed with liners for containers on the cargo-scarce leg of the voyage; some bulk carriers are moving bulk in one leg and containers on the other leg. As shown in Table 3.8 and Figure 3.2, non-liners have already penetrated the container market once monopolized by liners.

4) The role of tramps in carrying containers has become more important due to the availability of container ship chartering. Some tramp vessels are designed primarily for breakbulk cargos with a fair container intake; the multipurpose semi-container vessels become an alternative to container lines. However, most tramp vessels can carry less than 1 000 TEUs and operate at a slower speed, generally 14-16 knots. Therefore, the

conference lines still have great advantages of economies of scale and lower transit times over the tramps in container operations.

In summary, non-liners which include tramps, special-chartered vessels, and bulk carriers have made liner markets highly contestable. Non-liners mainly compete with liners for the packaged but not containerized breakbulk cargo. In addition, conference lines may face strong competition from non-conference lines in the container market; when this happens, conference members are under heavy competitive pressures as has occurred recently in most conferences.

3.2.3 Competition from Non-Conference Lines

The conference system faced a great challenge from non-conference lines in the early 1980's. During the period from 1980 to 1983, rate wars erupted between conference and non-conference lines on several major world trade routes, notably, the North Atlantic, Transpacific, and Europe-Far East routes. Although rate wars within the liner industry do occur from time-to-time, the latest one has been the longest and most severe to date. First, it lasted more than three years and caused a number of lines to withdraw from liner markets. Second, it put the conferences on the defensive. Although some strong conferences, such as the ones operating on the North Atlantic, were able to return from the brink of collapse and finally won the battle for survival after taking a series of steps to rationalize services and reform rates, the outside competition created a chaotic situation on the Transpacific routes and resulted in the dissolution of the Pacific Westbound Conference.

During the rate wars, a number of independent lines, such as Cast, Evergreen, and Trans Freight Lines, were able to compete advantageously against conference lines, despite the cartel set up by the latter in the liner market. There are probably a great number of reasons for their success. However, the following five may well be the most important ones:

First, conferences, in general, underestimated the ability of outsiders to build up container TEU capacity by the adoption of large bulk/container vessels. As a result, the conferences were unprepared for attacks by the non-conference lines, and the latter had a chance to secure a foothold in a number of major container routes.

As shown earlier in Table 3.8, in 1982, the non-conference lines on the Canada-North Atlantic route carried more than 25% of the containerized cargo, and on the Pacific route, the non-conference lines' share was close to 20%.

Second, the outsiders used the freight all kind (FAK) commodity box rate to compete for high-value cargo. Conversely, the conference lines were handicapped by the century old and restrictive conference tariff. The slowness of change to meet the needs of the container era fully exposed the innate weakness of the conference system.

Although liner conferences have dominated in container movements, they have been slow in making the necessary rate adjustments. In fact, it was only when their operational positions were threatened by the non-conference lines that the conferences, such as the Far East Freight Conference (FEFC), and the four North Atlantic conferences serving Canadian trades, started to adopt commodity box rates.

Third, the implementation of the inland point-to-point intermodal service and the through rate system was another reason why some outsiders were in an advantageous position in competing with the conference lines. The intermodal through rate enabled non-conference carriers, such as Cast, to gain cargos from a broad hinterland, e.g., from inland Canada as well as the U.S. Midwest markets. Although, in some geographical areas conference lines also offer door-to-door intermodal rates, their main tariffs are still port-to-port based.

Fourth, in recent years, a number of outsiders have been able to establish their goodwill as regular and reliable liners. They are no longer the "fly-by-night" type of opportunists but rather oriented to long-term commitment. For example, Cast operated a weekly liner service between Montréal and ports in continental Europe; its performance on a port-to-port transit time basis is compared with conference lines in Table 3.9.

The average speed of Cast vessels was 14.5 knots while SLCS vessels (conference) operated on a speed of 18 knots per hour. Cast vessels also stayed longer in the port because of their mixed bulk/container operation. However, because it concentrates on a narrower range of ports of call than the conference lines, for example, Cast did not have a direct call in the U.K., its transit time between Canada's East Coast and continental Europe was, in fact, better than conference lines on the westbound route.

Table 3.9

COMPARISON OF AVERAGE TRANSIT TIME BETWEEN CONFERENCE AND NON-CONFERENCE LINES OPERATED ON THE EUROPE/CANADA ROUTES

EUROPE/CANADA - AVERAGE TRANSIT TIMES
(days)

	Halifax		Montréal	
Antwerp	W/B	E/B	W/B	E/B
ACL(i)	-	-	16.6	12.0
ACL(ii)	18.7	9.0	-	-
Cast	-	-	10.7	12.0
Hapag-Lloyd	12.0	7.6	-	-
St. Lawrence Coordinated Service	-	-	11.2	10.7

	Halifax		Montréal	
U.K.	W/B	E/B	W/B	E/B
ACL(i)	-	-	8.3	9.8
ACL(ii)	15.1	6.4	-	-
Cast	-	-	12.7	14.0
Hapag-Lloyd	5.6	13.7	-	-
St. Lawrence Coordinated Service	-	-	8.6	10.1

Notes: (i) Montréal service; (ii) Halifax service

Source: Lloyd's of London Press 1981. This table is reproduced from Lloyd's Shipping Economist, March 1982.

As shown in Table 3.9, from Antwerp to Montréal, the average transit time of Cast vessels was shorter than that of conference lines in 1981; while eastbound, Cast's performance was equal to ACL. However, to and from the U.K., Cast lagged behind the conferences lines because of transshipment.

On the North Atlantic route, Cast also achieved economies of scale by chartering large container/bulk vessels. The five big con-bulkers operated by Cast in late 1982, namely, Caribou, Polarbear, Husky, Muskox, and Otter, all had a container capacity of 1 466 TEUs. The low cost per slot of these new vessels made Cast rates very competitive in the Transatlantic liner container markets. Moreover, by use of the con-bulkers, Cast was able to secure most of the non-containerized liner cargos.

Fifth, because some conference lines operating fully cellular container ships serve only ports with container handling facilities, the non-conference lines have an opportunity to pick up breakbulk cargo left by the conference carriers in ports which are not on the conference lines' direct-call schedules.

Overall, the inability to take a rapid unified stance to match rates with outsiders was the most serious problem of the conference system. As a result, a massive withdrawal of membership took place within the PWC; where the conference once represented as many as 19 out of the 25 lines operating in the trade, it had only 10 member lines out of 31, with a market share of 45% by September 1984.[5] The major member lines, such as Hapag-Lloyd, Sea-Land, Maersk, and APL had dropped out of the conference one after the other in order to take independent rate action and gain greater pricing flexibility. The PWC was finally dissolved. As a consequence of the failure of the conference, member lines were undercutting each other, which has lead to the proposal of setting up a new Transpacific Westbound Conference. In fact, at the time of writing, 20 carriers have reached a new agreement; the new conference has been filed at the Federal Maritime Commission.

However, on the North Atlantic route, the conferences have regained their strong positions by including Cast (1983) as an associate member. The conferences' success was due mainly to the market power generated by rationalization, the existence of a consortium, and rate reforms.

Other conferences responded to the challenge of non-conference lines by offering a variety of rate and service "specials". For instance, Japan-Korea/Western Canada Conference introduced a low mini-bridge tariff to serve the eastern Canadian market through Vancouver. Conference lines have also offered a myriad of similar services e.g., special commodity rates, rates in U.S. dollars, no CAF and BAF, open rates, etc.

3.2.4 Competition Between Conferences

Although competition between conferences serving the same route can sometimes be eliminated by an overlap in membership, such as the case in the Canadian North Atlantic conferences, other conference competition exists because of the mini-bridge and landbridge transportation network. For instance, in the early 1970's, Canadian industrial heartland traffic, centred on Toronto, was being drained away by carriers serving U.S. North Atlantic ports.[6] However, by the early 1980's, these transborder routings were reversed as the SLCS and Cast managed to move U.S. Midwest cargo through Montréal.

Also, for example, in the Canada-Far East trades, carriers serving the Canadian West Coast are able to divert traffic originating in or destined to the eastern parts of Canada through efficient long-haul rail operations. As a result, the East Canada/Far East conferences not only face the strong competition coming from the southern U.S. East Coast conferences, but also from conferences operating to the West Coast of Canada and the U.S.

Evidence of interconference competition can sometimes be found in the conference tariffs. For instance, the tariffs of continental Europe conferences contain a separate section for Italian traffic which is diverted to and from the European North Atlantic ports, and thus, is indirectly in competition with the Mediterranean conferences. Moreover, the Pacific Westbound Conference tariff includes two sets of rates; one applies to local and the other to overland traffic. The overland rates, which are lower than local rates, apply on cargo originating east of the Saskatchewan-Manitoba boundary line when moving on a through export bill of lading.

The presence of competition from U.S. carriers is observed from data on transborder cargo movements. It is also evidenced by the presence of various representative agencies of U.S. carriers in Canada and their advertisements in Canadian Sailings.

3.3 The Effect of the Multimodal System on the Structure of the Liner Market

Traditionally, when a cargo movement involves at least two modes, the transportation system is called an intermodal service. In the intermodal system, if one of the carriers acts as a principal and assumes both the responsibility of organizing the transport service under one bill of lading and the liability of risk, this carrier is considered as the multimodal operator. In recent years, more and more lines have acted as multimodal container carriers. This is probably the most important development in the liner industry since the container revolution began in the late 1950's.

Liner intermodal service involves direct interchange from inland carriers to ocean carriers or vice versa while the cargo is moved from the originating point to the destination point under one bill of lading. This intermodal concept can be applied to regular door-to-door or point-to-point services as well as to transshipments such as landbridge and mini-bridge. Landbridge involves two waterborne shipments at either end of a central road/rail hauled movement; mini-bridge is defined as a through movement under a single bill of lading which transfers at the unloading port to a train service serving a rail terminal in some other port city.[7]

The multimodal concept has important effects on the liner industry in three areas; specifically, service, competition, and the conference rate structure.

First of all, in the conventional system, shippers and consignees usually decide through which ports the cargo should be moved; however, in the intermodal network, it is the carriers who decide on the port of call. Moreover, the economies of scope are greatly increased in the new system.

Secondly, the competition between shipping conferences has been greatly enhanced as a result of intermodal networks. On the one hand, liners have found themselves a much larger hinterland than the traditionally defined area; on the other hand, they also face competition from all directions. The inland transportation modes enable cargo movements through various routings.

Table 3.10 shows transborder container movements between the United States and Canada for the period from 1977 to 1983. On the West Coast, although the total number of containers in Canadian trades routed through U.S. ports increased by 55% during the six-year period, the increase was more for imports than exports; only a small number of U.S. containers went through Canadian West Coast ports. In fact, the number was actually declining. However, on the East Coast, containers routed through U.S. ports decreased by 23% in Canadian trades; conversely, U.S. trades via Canadian ports increased by 51% during the same period.

The increase in U.S. container movements via Canadian East Coast ports has been the result of two factors. First, both Canadian North Atlantic conferences and Cast, the independent line, had offered advantageous intermodal rates to U.S. and Mid-west shippers. Second, U.S. conferences could not offer intermodal rates because of restrictions placed upon conferences by the U.S. regulatory system.

However, the situation may change. As a result of the new Shipping Act of 1984 as well as deregulation in the rail and truck industry, the U.S. conference lines can become competitive again with the conferences operating on the Canadian East Coast in container intermodal services. This may affect the business in Canadian ports.

Table 3.10

TRANSBORDER CONTAINER MOVEMENTS BETWEEN CANADA AND THE U.S.
('000 TEU)

A. Canadian Trade Via U.S. Ports

	East Coast			West Coast			
Years	Import	Export	Total	Import	Export	Total	Total Canada
1977	23.2	29.5	52.7	29.4	11.7	41.1	93.8
1978	21.7	23.8	45.5	33.2	15.6	48.8	94.3
1979	20.0	26.3	46.3	33.9	15.6	49.5	95.8
1980	18.5	26.3	44.8	38.3	18.4	56.7	101.5
1981	15.5	22.7	38.2	40.5	13.2	53.7	91.9
1982	18.5	27.5	46.0	41.0	13.4	54.4	100.4
1983	19.7	21.0	40.7	47.4	16.1	63.5	104.2

B. U.S. Trade Via Canadian Ports

	East Coast			West Coast			
Years	Import	Export	Total	Import	Export	Total	Total U.S.
1977	47.3	32.4	79.7	2.3	1.4	3.7	83.4
1978	51.8	40.3	92.1	0.4	1.0	1.4	93.5
1979	56.4	47.9	104.3	0.2	.9	1.1	105.4
1980	52.7	53.0	105.7	1.1	.9	2.0	107.7
1981	68.9	57.1	126.0	0.6	1.1	1.7	127.7
1982	53.8	45.5	99.3	0.1	.9	1.0	100.3
1983	69.8	50.9	120.7	1.0	.6	1.6	122.3

Source: Revenue Canada

Finally, the effect of the intermodal services on conference tariffs is analysed in Chapter 4. However, the significance of the impact of intermodal service on the conference rate structure can be seen from the following quotation:

"Already 20-30% of conference cargos are being carried on an intermodal pricing basis. The new rate structure sometimes gives rise to paradoxical situations. For example, it is actually cheaper for a whisky importer in New York to have his shipments routed via Chicago because the rail freight charges for the Chicago-New York stretch plus the Scotland-Chicago rate works out cheaper than direct shipment to New York. From this example, it will be clear that the point-to-point rates have undermined the conference structure on the North Atlantic."[8]

Chapter 4

THE SHIPPING CONFERENCE SYSTEM

Almost as soon as regular liner services were established on major world trade routes in the late 19th century, shipowners found that it was necessary to establish uniform rate and service agreements in order to deal with various problems which resulted from providing a fixed schedule service, such as, fluctuation in demand, excess capacity, competition from tramps, and most of all, rate wars. These agreements have been known as shipping conferences.

More recently, the liner conference is defined by the United Nations Conference on Trade and Development (UNCTAD) code of conduct as "A group of two or more vessel operating carriers which provides international liner service for the carriage of cargo on a particular route, or routes, within specified geographical limits and which has an agreement or arrangement, whatever its nature, within the framework of which they operate under uniform or common freight rates and any other agreed conditions with respect to the provision of liner services".

In this chapter, four major subjects related to the conference system are discussed in separate sections. Section one analyses two common methods used by conferences in controlling competition, namely, entry control and service rationalization in Canadian liner trades. Section two examines conference tariffs, particularly the rate systems and the structure of commodity rates. Section three analyses the effect of intermodal rates on the structure of conference rates. Finally, section four discusses recent developments in conference regulation.

4.1 Control of Competition

The market powers of conferences may differ depending on the degree of control of internal competition. Generally speaking, the most effective strategies a conference can adopt to eliminate competition among its members consist of entry control, service rationalization, and rate agreements. This section will discuss the first two methods and the next section will analyse conference tariffs.

4.1.1 Entry Control

First, from the perspective of entry restrictions, conferences can be broadly categorized into two types, namely, the "closed" and the "open" conferences. The closed conferences restrict their membership, and thus, the entry to the liner market covered by the conference. A closed conference may or may not have market-sharing provisions. However, the most efficient closed conference is the one cooperatively organized and appropriately rationalized (COAR). The open conferences, which comprise about one-third of the world's total conferences, cover primarily the trade to and from the United States. Conferences engaged in U.S. liner trades are regulated by the Federal Maritime Commission (FMC). The FMC has the power to disapprove any conference agreement which fails to "provide reasonable and equal terms and conditions for admission and readmission to conference membership for any ocean common carrier willing to serve the particular trade or route" (Shipping Act of 1984). These conferences are not allowed to restrict their membership along national or other lines.

In Canada, however, the Shipping Conference Exemption Act (SCEA), passed in 1979, allows closed conferences to operate in Canadian trade routes. Therefore, except those joint-conferences which serve both Canadian and U.S. trades, Canadian conferences generally restrict entry.

Presumably, the frequency of entry and exit is higher in the open conference than the closed conference. This is proved by Table 4.1 which presents a comparison of numbers of entry and exit between open and closed conferences serving Canadian trades during the period from 1975 to 1982. As shown in the table, the closed conferences, such as, the Canada-U.K. and the Western Canada-Europe freight conferences have relatively fewer changes in membership than the open conferences as represented by the Pacific Westbound and the Pacific Coast River Plate Brazil freight conferences.

Table 4.1

NUMBER OF ENTRY AND EXIT

COMPARISON BETWEEN OPEN AND CLOSED CONFERENCES
SERVING CANADIAN TRADES
1975-1982

	Membership as of Jan. 1975	New Lines Admitted During the Period	Lines Leaving Conferences During the Period
Closed Conferences			
Total (24 conferences)	137	28	31
Canadian North Atlantic Conferences	5	1	0
Western Canada - Europe	12	2	3
Open Conferences			
Total (20 conferences)	120	71	59
Pacific Westbound	15	5	4
Pacific River Plate Brazil	3	4	2

Source: Canadian Transport Commission. The Supply of Liner Shipping in Canada, Report No. 1984/03, June 1983, Tables 3 and 4.

4.1.2 Service Rationalization

The three common practices used by conferences to rationalize capacity and restrain internal competition are sailing quotas, cargo sharing, and port allocation. These rationalization schemes give conferences advantage over outsiders in competition.

Recently, the most notable case of liner service rationalization has been the establishment of the St. Lawrence Coordinated Services by members of Canadian North Atlantic conferences in August 1981.

In fact, before the implementation of SLCS, the North Atlantic conferences had already adopted the policy of port allocation and cargo sharing. The four conferences serving inbound and outbound trades between Canada and the United Kingdom, and continental Europe, respectively had a common membership of five lines, namely, ACL, Hapag-Lloyd, Dart, CP Ships, and Manchester Liners. Of these five lines, Hapag-Lloyd and Dart operated to the East Coast ports, with direct calls to Halifax and services to St. John's via feeder service and to Saint John via inland transport; CP and Manchester Liners served mainly to the St. Lawrence and Great Lakes, with Montréal as the port of direct call. Only ACL served both Montréal and Halifax. All of the five lines operated on weekly schedules except ACL's Montréal service which was on a 10-day basis.

In 1981, Dart dropped Halifax as its port of call and joined CP and Manchester Liners in SLCS. The three lines maintain a weekly service between Montréal, Felixstowe, Hamburg, Antwerp, Felixstowe, le Havre, and Montréal with a fleet of four 23 knot, 1 800 TEU full cellular vessels. After the rationalization, CP pulled out of Tilbury in the U.K. and Rotterdam, Manchester Liners out of Greenock and Liverpool, and Dart out of Southampton. The SLCS was a strategy devised by conference lines to realize economies of scale and counter the growing competition of Cast. The service enabled the three lines to achieve great savings on fuel, crew, and port charge costs.

In SLCS cargo sharing, the initial arrangement was that each line was to have a one-third share of the slots. However, in later developments, CP ended up with a 40% allocation of SLCS's slots, and Dart Canada and Manchester Liners each shared 30% of the slots, respectively.

4.2 Liner Conference Tariffs

Generally speaking, the liner tariffs published by shipping conferences are voluminous and complicated. In addition to pages of rules and regulations concerning the application of rates and surcharges, a vast variety of rates are quoted for different commodities. Although, some conferences which depend mainly on container operations have recognized the need for rate reform, they have so far changed only the rate basis, i.e., from the weight/measurement (W/M) units to commodity box rates (CBRs), without even a reduction in the number of commodity classifications. In the following two subsections, rate systems and rate structures reflected in conference tariffs will be discussed.

4.2.1 Rate Systems

Presently, there are four different kinds of liner rate bases, namely, the W/M, CBR, freight all kinds (FAK), and point-to-point intermodal rates.

The conventional weight or measurement system quotes rates on a per 1 000 kilogram or one cubic meter basis.

Surcharges, such as CAF and BAF are usually added onto commodity rates.

The commodity box rate system adopts lump sum rates for 20 and 40 foot containers, although in some cases, special handling costs are to be added. For example, the CBR rate quoted by the North Atlantic conferences are subject to a container height limit of 8 feet 6 inches with an additional 12.5% applied on containers over this height limit; heavy-lift charges are imposed on 20 and 40 foot containers over 25 and 30 tons, respectively.

The CBR system allows for a degree of differentiation between various types of cargos. Therefore, an element of the traditional "what the traffic will bear" formula is retained under the CBR structure.

The conversion from W/M rates to the CBR structure in North Atlantic conferences has not resulted in the simplification of the liner tariff since the same commodity classification is maintained. Although a few commodity groups were combined, new items were also added. Therefore, no significant reduction in the number of commodities appear in the new conference tariffs. For example, 129 new commodity items were added to the tariff of the Canadian Continental Eastbound Freight Conference in 1983, although some of them are on a temporary basis. Furthermore, the three different rates corresponding to Services 1, 2, and 3 are retained; only house-to-house and house-to-pier services are quoted the commodity box rates while the pier-to-pier rate is still based on weight or measurement, whichever generates more revenues. For some commodity groups, rates for both 20 and 40 foot containers are quoted. For others, only a 20 or 40 foot container rate is quoted.

Moreover, there is evidence that the commodity box rates are calculated based on the average weights per container of individual commodity groups. For instance, the conversion factors, which are calculated by dividing the CBR rates in January 1983 by W/M rates in December 1982, are shown in Tables 4.2 and 4.3 for the Canada-United Kingdom and the Canadian Continental Eastbound conferences, respectively. As shown in the tables, the rate differentiation between various types of commodities is retained under the CBR structure. Although some shippers may gain and others may lose a bit because of the averaged conversion factor, the "what the traffic will bear" principle seems unchanged. The relationship between the CBR and the W/M rates is examined further in the discussion of rate structure models in Chapter 6.

The freight all kinds rate (FAK) refers to a standard pricing system where rate differentials between containerized commodity groups are largely if not totally eliminated. The FAK rate system is generally considered unworkable in the liner ship-

Table 4.2

COMPARISON BETWEEN WEIGHT-BASED COMMODITY RATES AND COMMODITY BOX RATES CANADA - U.K. FREIGHT CONFERENCE

	Commodity	Commodity Box Rates (Jan. 1983)		Commodity Rates per Tonne (Dec. 1982)	Average Tonnes per Container*	
		20'	40'		20'	40'
3727	Herring fillets	1 925	2 750	166.5	11.6	16.5
3912	Cod blocks and slabs	-	3 105	217.5	-	14.3
4442	Salmon, pink canned	1 200	-	82.0	14.6	-
4443	Salmon, sockeye canned	1 200	-	82.0	14.6	-
4649	Shrimps, fresh/frozen	-	4 190	288.0	-	14.5
5114	Cheese, cheddar	1 230	1 580	68.5	18.0	23.1
9309	White pea beans	575	-	78.5	7.3	-
9550	Corn, canned	1 113	-	59.0	18.9	-
15660	Fish meal, n.e.s.	1 105	-	61.5	18.0	-
15703	Pelleted screening	1 930	-	109.0	17.7	-
18210	Tobacco, stemmed	1 050	-	74.0	14.2	-
27120	Asbestos, grp. 3	842	1 470	72.8	11.6	20.2
27130	Asbestos, grp. 4 and 5	842	1 470	72.8	11.6	20.2
27140	Asbestos, grp. 6-9	800	1 470	68.5	11.7	21.4
33872	Plywood, Douglas fir	1 235	3 190	165.0	7.5	19.3
33879	Plywood, softwood, n.e.s.	1 235	3 190	165.0	7.5	19.3
34019	Wood pulp	725	-	65.0	11.2	-
35109	Newsprint paper	-	1 055	77.0	-	13.7
35149	Groundwood printing paper	1 090	1 640	86.0	12.6	19.0
35439	Wrap paper	930	1 570	78.5	11.8	20.0
35610	Liner board	930	1 300	79.5	11.7	16.4
35619	Corrugating container board	1 160	1 800	79.5	14.6	22.6
36699	Man-made fibre yarn	1 160	2 020	214.0	5.4	9.4
37790	Broad woven fabrics	1 600	3 170	109.5	14.6	28.9
40246	Cobalt oxides	880	-	43.75	20.1	-
42316	Polythene resins	1 240	-	72.5	17.0	-
42399	Plastic and synthetic rubber	1 090	-	95.0	11.5	-
42499	Plastic film and sheet	1 460	-	84.5	17.3	-
44450	Steel wire rods	840	-	46.0	18.3	-
44555	Sheet and strip steel	1 010	-	56.5	17.9	-
45109	Alum. pigs and ingots	855	-	53.0	16.1	-
45204	Copper, refinery shape	855	-	173.5	4.9	-
45309	Lead, pigs, block, sheet	850	-	43.0	19.8	-
45415	Nickel anodes	880	-	43.0	20.5	-
45499	Nickel, alloy fabricated	880	-	43.0	20.5	-
45708	Zinc, blocks, pigs, slabs	850	-	43.0	19.8	-
47619	Fused alumina	855	-	52.0	16.4	-
54372	Combine reaper-threshers	1 460	2 490	99.0	14.7	25.2

* Average tonnes per container = commodity box rate ÷ commodity rate per tonne.

Source: Tariffs of the Canada-U.K. Freight Conference 1982 and 1983.

Table 4.3

COMPARISON BETWEEN WEIGHT-BASED COMMODITY RATES AND COMMODITY BOX RATES CANADIAN CONTINENTAL EASTBOUND FREIGHT CONFERENCE

	Commodity	Commodity Box Rates (Jan. 1983) 20'	Commodity Box Rates (Jan. 1983) 40'	Commodity Rates per Tonne (Dec. 1982)	Average Tonnes per Container 20'	Average Tonnes per Container 40'
3327	Herring, fresh, whole	2 000	3 200	168.5	11.9	19.0
3912	Cod, blocks and slabs	2 000	3 250	168.5	11.9	20.9
4324	Herring, fillet, cured	2 000	3 200	168.5	11.9	19.0
4620	Crabs, fresh or frozen	2 400	4 220	279.5	8.6	15.1
4624	Lobster, fresh or frozen	2 090	4 220	240.0	8.7	17.6
4676	Crab, canned	1 920	2 510	124.0	15.5	20.2
7226	Blueberries, frozen	2 090	3 600	202.0	10.3	17.8
9282	Potato product, frozen	-	4 520	251.0	-	18.0
18210	Tobacco, stemmed	-	1 550	80.0	-	19.4
20110	Cattle hide, raw	1 400	1 695	88.5	15.8	19.1
21235	Mustard seed	1 125	-	74.0	15.2	-
21270	Sunflower seed	1 125	1 060	93.5	12.0	11.3
25350	Brass and bronze scrap	960	1 435	63.0	15.2	22.8
25390	Copper alloy scrap	960	1 435	63.0	15.2	22.8
25439	Lead, alloy	960	1 435	63.0	15.2	22.8
33719	Veneer hardwood	1 235	2 350	123.5	10.0	19.0
34840	Woodpulp, sulphite	1 090	1 130	51.5	21.2	21.9
35109	Newsprint paper	1 000	1 340	77.0	13.0	17.4
35610	Liner board	1 065	1 620	87.0	12.2	18.6
36619	Rayon, yard	1 145	2 000	101.5	11.3	19.7
37519	Rayon, woven fabric	1 750	2 620	103.0	17.0	25.4
41199	Nitrogen, pure compound	2 345	-	120.0	9.5	-
42316	Polyethylene resin	1 175	1 575	108.5	10.8	14.5
42399	Plastic rubber	1 525	-	129.0	11.8	-
42999	Indus. chem., explosive	4 355	8 710	208.5	21.0	41.8
44450	Wire rods, steel	840	-	46.0	18.3	-
44530	Sheet and strip steel	1 385	-	91.5	15.1	-
45109	Alum. pigs, ingots	910	-	53.0	17.2	-
45204	Copper refinery shape	910	-	44.25	20.6	-
45215	Copper pipe and tubing	2 080	2 535	118.0	17.6	21.5
45309	Lead, pigs, blocks	910	-	44.25	20.6	-
45415	Nickel anodes, ingots	920	-	47.75	19.3	-
45708	Zinc, block	910	-	44.25	20.6	-

Source: Tariffs of the Canadian Continental Eastbound Freight Conference, 1982 and 1983.

ping industry except on routes where cargo mix is very homogeneous. As the FAK rate, in general, favours the shipper of high-value commodities, it is not consistent with the traditional value-of-service pricing principle.

In recent years, FAK rates have been offered by some non-conference lines in attempts to "cream off" the conference's high-revenue cargos. For example, in 1983, the tariff of Cast contained FAK rates for 234 outbound and 54 inbound commodity classes which was much simpler than the conference tariffs which contained separate rates for about 700 outbound and over 1 000 inbound commodity items.

Nevertheless, in order to fight the outside competition, some conferences have also adopted FAK rates, although mostly on a temporary basis. For instance, in July 1982, the Far East Freight Conference (FEFC) introduced a simplified tariff with only 15 commodity classes for a three-month transition period.

The point-to-point through rate system refers to a single bill of lading issued by ocean carriers for moving commodities from inland points in one continent to inland points in another continent. It is also known as the intermodal rate system. Intermodal rates will be discussed further in Section 4.3.

4.2.2 The Structure of Commodity Rates

As it appears in shipping conference tariffs, liner rates on a particular route can differ widely between various types of commodities and services. The rate differentials are caused by three major factors, namely, the institutional, the cost, and the demand influences.

First, the rate difference between contract and non-contract rates is a result of the conference system where customers signing a loyalty or patronage contract with the conference are charged a lower rate; in Canada the difference between the contract and non-contract rates is commonly 15% as this is the maximum allowed by the Shipping Conference Exemption Act.

Second, rate differentials between different types of services can be largely accounted for by the cost factor, that is, the differences in operating costs. These include rate differentiation between containerized and non-containerized cargos as well as the relatively higher rates quoted for hazardous, refrigerated, and extra-heavy cargos, etc. Moreover, cost factors, such as, stowage factors, average weight or size of shipment, etc., account for a part of the variations in commodity rates.

Third, rate differentiation between different types of commodities are attributable to demand factors. As such, it is much more complex than rate differentials between services. Demand factors, such as volume, the unit value of a commodity, the degree of competition, the shipper's bargaining power, seasonality or frequency of shipment, etc., contribute largely to the determination of the levels of commodity rates. For example, the application form used for establishment of an ocean rate or modification of an existing rate by the Canadian North Atlantic Westbound Freight Conference is shown in Exhibit 1. In the form, items 10, 11, 12, 16, and 17 are cost-related information while items 8, 12(g), 13, 14, and 15 are clearly demand influences in the establishment of liner rates.

Overall, the levels of commodity rates are subject to many influences. Because some demand factors, such as value, have a positive effect on the liner rate, while others, such as competition, have a negative influence on rate levels, the resulting liner conference tariff is very complicated. Although there is a great variety in the rates for different commodities, no evidence of systematic price discrimination can be easily established. For instance, some high-value cargos are quoted very low rates which is contradictory to the known "value-of-service pricing" rate structure of conferences. However, by and large, conferences adopt a "what the traffic will bear" rate structure.

Since the relative importance of cost or demand factors in the establishment of commodity rates cannot be determined by examining the conference tariff alone, empirical statistical analyses have been used by economists, for example, Bryan[9], Zerby and Conlon[10], etc., to analyse the liner rate structure and to test various theoretical assumptions, such as, intratariff cross-subsidies, value-of-serving pricing, etc. In this study, empirical rate structure models are developed for liner rates on the Canada-West Europe and Canada-Japan trade routes. The explanatory variables analysed in the models include volume, number of shipments, average weight per shipment, stowage factor, unit value of the individual commodity group, volume carried by non-conference lines, number of vessel voyages in which a commodity is carried, intermodal rates, and a dummy variable designated for refrigerated cargos. The results and analyses are presented in Chapter 6.

Exhibit 1

(Computer repoduction of original document)

CANADIAN NORTH ATLANTIC WESTBOUND FREIGHT CONFERENCE

TARIFF "36"

Original Page 37

REQUEST FOR ESTABLISHMENT OF OCEAN RATE OR MODIFICATION OF EXISTING RATE

1. NAME AND ADDRESS OF SHIPPER

2. (a) NAME AND ADDRESS OF CONSIGNEE (b) ULTIMATE DESTINATION (NOT PORT OF ENTRY)

3. NAME AND ADDRESS OF FORWARDING AGENT (IF ANY)

4. COMMODITY (GIVE COMPLETE DESCRIPTION AND USAGE INCLUDING CORRECT CHEMICAL NAME, WHERE APPLICABLE. ATTACH LITERATURE, BROCHURES ETC. IF AVAILABLE)

5. S.I.T.C. AND/OR B.T.N. NUMBER(S)

6. IF HAZARDOUS CARGO STATE NATURE OF HAZARD GIVING FLASHPOINT AND REQUIREMENTS OF H.M. DEPT. OF TRADE AND INDUSTRY RULES AND REGULATIONS FOR CARRIAGE OF DANGEROUS GOODS IN SHIPS.

7 PRESENT OCEAN TARIFF RATE (IF ANY) | 8. RATE REQUIRED

9. IF RATE MODIFICATION PLEASE GIVE FULL REASONS FOR REQUEST

10. TYPE OF PACKING

11. WILL COMMODITY BE PRESENTED TO THE LINES
    - (a) Loose
    - (b) Palletized
    - (c) Unitized
    - (d) Containerised

    Tick whichever applicable

12. PARTICULARS OF COMMODITY (PACKED OR UNPACKED) - PER PIECE OR PACKAGE (METRIC DIMENSIONS)
    If Palletized or Unitized, state gross and net weight and measurement of load or unit load.

(a) Length: (b) Width: (c) Height: (d) Cube:

(e) Weight per Pkg. or Piece (f) Cubic Metres per 1,000 kilos

(g) F.O.B. Value per 1,000 kilos

13. TOTAL WEIGHT ON THIS COMMODITY SHIPPED VIA THIS CONFERENCE DURING THE PAST 12 MONTHS

14. ANTICIPATED ANNUAL MOVEMENT OF THIS COMMODITY VIA THIS CONFERENCE IN WEIGHT TONS (1,000 KILOS) IF REQUEST GRANTED

15. TOTAL SHIPPED THIS YEAR TO DATE, IN WEIGHT TONS (1,000 KILOS)

16. SPECIFY TOTAL WEIGHT IN KILOS AND TOTAL MEASUREMENT IN CUBIC METRES TO BE STOWED IN A CONTAINER

20' CONTAINER		40' CONTAINER	
Kilos	Cubic Metres	Kilos	Cubic Metres

17. SPECIFY TYPE OF CONTAINER (IF REQUIRED AND AVAILABLE) WHICH IS NEEDED TO CARRY THIS COMMODITY - DRY - TANK - REEFER - INSULATED - OPEN TOP - HALF WEIGHT ETC.

18. INDICATE WHO IS RESPONSIBLE FOR PAYMENT OF FREIGHT

SHIPPERS SIGNATURE ______________________ TITLE ______________________

TELEPHONE NUMBER ______________________ TELEX NO. ______________________

DATE ______________________

(Note: This form must be completed and signed by the actual Shipper or Consignee of the Cargo)

Canadian Atlantic Freight Secretariat Ltd.,
Cunard Building,
LIVERPOOL L3 IDS.

4.3 The Effect of Intermodal Rates on the Structure of Conference Rates

Recently, intermodal rates have been used by outsiders to compete advantageously with the port-to-port rates of conference lines. In response, some conferences have also incorporated door-to-door rates into their tariffs, and others have allowed their members to file separate intermodal rates. Consequently, the intermodal rate system has gained great importance in the liner shipping industry.

Table 4.4 shows the number of intermodal door-to-door rates quoted in the tariffs of four North Atlantic conferences serving Canadian inbound and outbound trades. In the outbound movements, approximately 17% of liner CBRs to the U.K. and 21% to continental Europe are intermodal rates, while on the inbound leg the percentages are higher, specifically, 27% of total CBRs from the U.K. and 39% from continental Europe are quoted on a door-to-door basis. Because of the large number of door-to-door intermodal rates, the tariffs of inbound conferences include them in a separate section, that is, section two of the tariffs; while in the tariffs of the outbound conferences, the door-to-door and port-to-port commodity box rates are mixed together.

One of the major impacts of the intermodal rates on the conference pricing system is that it results in some paradoxical pricing, such as in the case where some through rates, including inland transportation services, are quoted at lower levels than the rates for port-to-port ocean services. Another major impact is that conferences have to allow more independent actions by their members. In 1984, the newly strengthened Canada North Atlantic conferences allowed some members to apply special door-to-door rates. For instance, in the tariff of the Canada-United Kingdom Freight Conference, the special rate quoted for "aluminum rods" from door Montréal to door Swansea, U.K. was $1 265 per 20 foot container. The rate was lower than port-to-port rates for other aluminum products and was only applicable to Cast (1983) Ltd., the Canadian line, and Hapag-Lloyd A.G. An empirical analysis of the impact of intermodal rates on the level and the structure of conference rates is presented in Chapter 6.

4.4 Conference Regulation

By and large, the conference system is accepted internationally in the liner shipping industry and conferences are exempted from antitrust laws in most countries. However, in order to obtain the immunity, conferences are often obligated by legislation to follow specific regulations, such as, filing rate agreements, allowing independent action, etc. The degree of control over conference practices vary from nation to nation. Certain maritime nations which are direct beneficiaries of the

Table 4.4

THE IMPACT OF INTERMODAL RATES ON THE STRUCTURE OF LINER TARIFFS

Conference 1984 Tariffs	Total Number of Commodity Rates	Number of Door-to-Door Commodity Rates	Door-to-Door Rates as % of Total Commodity Rates
Canada-United Kingdom	747	128	17.1
Canada-Continental Eastbound	687	147	21.4
Canadian North Atlantic Westbound	1 736	466	26.8
Continental Canadian Westbound	899	354	39.4

Source: Based on the conference tariffs filed with the CTC.

conference system tend to protect conferences from domestic and foreign regulations; while other governments consider it necessary to regulate conferences against the abuse of monopolistic power. The differences in regulatory systems have sometimes caused harm to the comity of nations. For instance, in the past, the United States had been confronted by the pro-conference European countries for the execution of specific conference regulations.

As detailed discussion and historical analysis of the development of conferences and related regulatory systems can be found in a number of studies,[11,12,13] this section concentrates only on three recent developments in conference regulations. Specifically, these are the revision of the Shipping Conference Exemption Act in Canada, the passage of the Shipping Act of 1984 in the United States, and the implementation of the United Nations Code of Conduct for Liner Conferences.

Firstly, in Canada, the SCEA of 1979 exempts certain shipping conference practices from the provisions of the Combines Investigation Act. Essentially, the SCEA allows conferences to impose rules and regulations on their member carriers in areas of rate agreements, patronage contracts, allocation of ports, sailing schedules, cargo sharing, and entry. However, under the SCEA, conferences are required to file a copy of any tariff, agreement, or contract with the Canadian Transport Commission (CTC). The Commission is also responsible for the administration of the SCEA and the investigation of any practice by the conference members that is the subject of a formal complaint by any person.

In early 1984, a bill in draft form was introduced in the Canadian Senate, with a number of major changes to the SCEA proposed to be effective April 1, 1985. It is worth noting that the draft bill would have provided the government with more influence and rigid control over liner shipping conferences. For instance, it contained the following major changes:

1) mandatory conciliations for tariff matters which cannot be resolved between the conference and the designated shippers' group;

2) in case of a breakdown in negotiations between the conference and the designated shippers' group on freight rates, the CTC may assume the right to appoint a conciliator who may be a government official;

3) in cases where a conference operates without competition from independent carriers, conference members shall be entitled to independent actions within a 15-day notice period;

4) the level of fines for offences will be raised; and

5) any form of agreement between conference and non-conference lines will be prohibited.

The above recommended changes have brought criticism from the shipping industry, particularly shipowner organizations in West Europe.[14]

However, the proposed bill was not passed and the SCEA is under review by the current government. The existing SCEA, unless amended or extented by proclamation, will expire on March 31, 1986. It is still uncertain to what extent the structure of the SCEA will be changed in the future.

Secondly, in the United States, the regulatory reform resulted in the passage of the Shipping Act of 1984. In section 2 of the new Act, the "declaration of policy", three purposes of the regulation are outlined:

"1) to establish a nondiscriminatory regulatory process for the common carriage of goods by water in the foreign commerce of the United States with a minimum of government intervention and regulatory costs;

2) to provide an efficient and economic transportation system in the ocean commerce of the United States, that is, insofar as possible, in harmony with, and responsive to, international shipping practices; and

3) to encourage the development of an economically sound and efficient U.S.-flag liner fleet capable of meeting national security needs."

As the Shipping Act of 1984 emphasizes minimum government intervention and harmony with international shipping practices, it is generally considered as a step toward reconciliation of the differences in conference regulations between western Europe and the United States.

The new Act contains some major changes to the Shipping Act of 1916. Most importantly, it provides conferences with intermodal ratemaking authority, streamlines the processing of carriers' agreements, broadens conference antitrust immunity, and allows closer cooperation and broader rationalization schemes within and among conferences. However, these advantages are balanced by the regulatory requirements that conferences allow member carriers the right of independent action and the ability to enter and leave the conference freely.

Under the new Shipping Act, the conference has to either incorporate the new rate in its tariff or allow the carrier to adopt the independent rate no later than 10 days after the receipt of the notice of independent action on any rate or service item. The conference agreement must also provide equal terms and conditions for admission to conference members for any ocean common carrier willing to serve the particular trade or route. Thus, the rule that requires the conference to be "open" is retained. However, an advisory commission on conferences in ocean shipping will be set up five and one-half years after the shipping legislation is enacted in order to determine whether the nation will best be served by closed or open conferences or by prohibiting conferences altogether.

Overall, the passage of the U.S. Shipping Act of 1984 will have a direct impact on Canadian liner services and seaports. With newly granted intermodal rate authority, the U.S. conferences will certainly try to divert Canadian cargos through U.S. ports. However, it is beyond the scope of this study to assess how significant the impact will be.

Finally, the entry into force of the U.N. Code of Conduct in October 1983 is one of the important recent developments in world liner trade. The U.N. Liner Code was first adopted in 1974 with the purposes of giving developing countries a greater participation in the liner shipping trade and controlling discriminatory or monopolistic practices of liner conferences, in order to achieve harmony and stability in the world liner trade. The U.N. Code has established a set of principles for the behaviour of liner conferences concerning freight rates, consultation between shippers and conferences, dispute settlements, and cargo sharing, etc.

The Code's 40/40/20 cargo sharing provision was the most disputed issue which delayed the implementation of the international agreement. Under the Code, the two trading nations equally share the volume of conference cargo, leaving a significant portion for member lines of third countries, such as 20%, of the conference trade. Consequently, some western countries, including the U.S., whose shipowners participate actively in cross-trades, have refused to ratify the Code. Non-maritime countries, who rely mainly on foreign vessels in international trade, have also expressed their concerns that the inefficiency that may be created by the national fleets of developing countries could result in higher freight rates, and that shippers may lose the freedom of choice of the more competitive and reliable lines. To date, Canada has not ratified the Code.

As of February 1, 1985, 59 countries, including many developed countries, such as the Federal Republic of Germany, the Netherlands, etc., have ratified the Code; these countries own more than the 25% of total world general cargo vessel tonnage required for the entry into force of the U.N. Code. However, the effectiveness of the Code is greatly weakened by the fact that it will not apply to major liner trades, particularly those between the member countries of the Organisation for Economic Co-Operation and Development (OECD). Moreover, the Code does not deal with independent lines which have gained more importance in world liner shipping during the past decade.

In summary, an assessment of the impact of the U.S. Shipping Act of 1984 and the U.N. Code of Conduct for Liner Conferences on Canadian liner shipping may be useful in the revision of SCEA.

Chapter 5

THEORETICAL MODELS OF CONFERENCE PRICING

5.1 A Review of Economic Theories on Conference Pricing

In a recently published CTC research report, J.E. Davies surveyed the principal bodies of theory on conference pricing in the liner shipping industry.[15] Davies classified the different theories into three groups, namely, the received theory, contemporary models of price determination, and the theory of contestable markets. A brief review of these theories is presented in this section.

First, the conventional received theory views conferences as monopoly cartels. Thus, the behaviour of the conference is analysed according to the neoclassic theory of monopoly pricing, where the conference is assumed to set profit-maximizing rates. The price and output equilibrium achieved under this model is at the level where the conference's marginal cost equals its marginal revenue. In the absence of competition, the monopoly profit-maximizing rate for an individual commodity is set according to the price elasticity of demand for liner service of the commodity. The lower the price elasticity, the higher the freight rate will be. The conference may also exercise price discrimination between different shippers of a commodity. Consequently, according to the received theory, the conference system tends to create inefficiency and misallocation of resources in the liner industry.

Normally, if conferences possess monopoly power, one would expect them to make extraordinary profits. However, there is no hard evidence of the existence of such profits. To reconcile the lack of monopoly profits with the conventional received theory, its supporters have developed a number of hypotheses. Specifically, they attribute the absence of above-normal profit to the weakness and inefficiency of the conference's cartel system. This school of thought is represented by Devanney, Sturmey and Jansson, and Heaver. Firstly, Devanney's cost-push rate spiral hypothesis claims that the profit of the conference is diminished as a result of the high costs of conference lines caused by overcapacity and service competition between conference members.[16] Secondly, Sturmey and Jansson explain the low profit in the liner industry by the existence of intratariff cross-subsidization.[17,18] Finally, Heaver has developed a conference revenue maximization model, by which he argues that conferences, in reality, pursue the objective of revenue (or sales) instead of profit-maximization.[19] None of these explanations, however, has proven wholly satisfactory under empirical testing.

In view of the weaknesses of the conventional received theory, an alternative model of conference pricing has been developed by B. Gardner[20] based on P.W.S. Andrews' normal cost theory of prices.[21] Essentially, it differs from the neoclassical theory of monopoly pricing in three areas, specifically, the definition of an industry, the time horizon incorporated within the model, and the price-setting method. Particularly, following Andrews' theory of pricing, Gardner maintains that the market structure of any trade is oligopolistic and that firms should be classified based on "similarity of process" rather than "similarity of products" as is done by the neoclassical theory. The process-based industry definition implies that the liner shipping industry is much more competitive than would be suggested by the neoclassical product-based definition. Gardner also assumes that the object of a liner shipping company is to maximize long-run profit, and consequently, lines within a trade practise entry-limit pricing, taking account of the immediate and possible future competition pressures. The normal cost model suggests that firms set prices by adding a gross profit margin, to average direct costs. The margin includes special costs, a contribution to general overhead, and a net profit.

The principal weakness of the normal cost model is that it remains incomplete. It does not mention the factors determining the mark-up over direct costs, in particular the size of the gross profit margin. Thus, it does not offer guidance to empirical studies of prices.

Finally, the theory of contestable markets has gained much more popularity among maritime economists since the publication of Contestable Markets and the Theory of Industry Structure by Baumol, Panzar, and Willig in 1982.[22] As suggested by J. Davies, the theory of industrial pricing in contestable markets may be an appropriate model of price determination in the liner industry. Therefore, it is discussed in more detail in the following section.

5.2 The Theory of Contestable Markets and the Liner Industry

A perfectly contestable market is defined by Baumol et al as one that is accessible to potential entrants. Specifically, it meets the following five conditions:

1) entry is completely free;

2) exit is costless;

3) entrants and incumbents compete on completely systematic terms, in that the productive techniques and market demand available to incumbents are also freely available to potential entrants;

4) entry is not threatened by retaliatory price changes, in that the incumbent does not change prices to respond to entry. Thus, potential entrants evaluate the profitability of entry at the incumbent firms' pre-entry prices; and

5) the incumbent must continue to serve all markets while the entrant is free to serve only some segments of the market.

In some respects, the theory of perfectly contestable markets is a generalization of the classical theory of perfect competition. In particular, Baumol et al claim that the analytical framework of perfect contestability can be directly applied to monopolistic and oligopolistic markets.

Moreover, the theory of contestable markets does not consider the number of firms in an industry as proper indicators of competition. Instead, the industrial structure and performance are assumed determined by the cost function of the firms and the demand for the industry's outputs.

Baumol defines an industry as a natural monopoly if, over the entire relevant range of outputs, the industry's cost function is subadditive. The strictly subadditive cost function can be expressed by the following formula:

$$C(\sum_{j=1}^{k} y^j) < \sum_{j=1}^{k} C(y^j)$$

Where y^j is the quantity of output produced by firms j, $C(y)$ is the cost function of a single firm to produce y, and k is the number of firms. In other words, a cost function is defined as strictly subadditive if it is more expensive for two or more firms to produce a given output than for a single firm to produce it at all relevant output levels.

By corollary, if the least costly number of firms is two or more, but still "quite small", the industry is defined as naturally oligopolistic; if a large number of firms is required to minimize the cost of production, the industry is defined as naturally competitive.

Essentially, the cost-minimizing industry structure, whether its nature is competitive, monopolistic, or oligopolistic, is considered efficient in the contestable market theory.

In contestable markets, sustainability is considered a necessary condition for equilibrium. A sustainable industry configuration must have a vector of sustainable prices, in that it needs fixed prices capable of deterring entry, without the threat of price changes in response to entrants, and which result in financial viability. The formal definition of sustainability given by Baumol et al is that "a vector of prices P^* is sustainable for a set of incumbent firms in an industry if the incumbent firms are financially viable at those prices and no potential entrant can find a marketing plan for which the anticipated economic profit $P^e y^e - C(y^e)$, exceeds the cost of entry $E(y^e)$."[22] Thus, the rules of sustainable prices imply zero economic profit after cost of entry or rents is accounted for.

In perfectly contestable markets where the number of firms equals or exceeds two, the equilibrium and sustainable price must be equal to both marginal and average costs. In other words, to obtain equilibrium in contestable markets, the $P=MC=AC$ condition of Pareto optimality (first best) must always be satisfied by the firms in a competitive or oligopolistic industry structure.

However, in a natural monopoly, the necessary condition for equilibrium in perfectly contestable markets is that the price equals the average cost, which in turn must equal or exceed marginal cost, i.e., $P=AC \geq MC$. This behaviour accords with the Ramsey principle (second best) for Pareto optimal pricing where the monopolistic industry with decreasing costs sets prices so as to result in minimum allocative inefficiencies. Where economies of scale exist at the firm's output level, marginal cost pricing may result in loss, and the markup of prices over MC, so as to yield a non-negative profit, are chosen inversely proportional to the elasticities of demand.

The constraint, $P \geq MC$, implies that sustainable prices must not involve cross-subsidization. If any product of the incumbent firm is subsidized by other products, the new entrant offering only remunerative products can cut prices and take advantage of the incumbent firm. Consequently, the prices for each of the firms' products must be at least as high as the marginal costs.

In summary, the theory of contestable markets emerges as a useful tool for the analysis of industrial structures and market behaviours. There are two contributions to microeconomic theory resulting from the theory of contestable markets. The first is a set of concepts and definitions which generalize the concepts of economies of scale and natural monopoly from single-output to multi-output firms. The second is a series of deductions as to the entry and pricing behaviour of firms in markets for goods and services which can be considered to be multiple outputs of a common production process. The first aspect of the theory is not controversial; the second aspect is very controversial.

Thus, for example, in a recent article, W. Sheperd has criticized the contestable theory because of its assumption of ultra-free entry. Essentially, Sheperd points out that the contestable theory does not distinguish total entry from trivial or small entry. Consequently, ultra-free entry involves inconsistent assumptions because if entry is trivial, it has no force and "the weak invisible hand theorem" cannot be established; on the other hand, if it is total (or significant) entry, then the assumption of non-response of the incumbent firm is not tenable. Based on the above arguments, Sheperd questioned the strength of the free entry assumption.[23]

Although the generality of the contestable theory has yet to be tested, the concepts of contestability are extremely useful in the analysis of the structure, conduct, and performance of the liner industry. As liner vessels can be chartered or moved from one route to another, a sudden total entry is possible, as is the growth of small entrants into major competitors in a short period of time. Therefore, the distinction between small and large potential entrants is not an important issue in the case of the liner industry. Consequently, the following subsections will examine the degree to which the theory of contestable markets is applicable to the liner market and liner conferences.

5.2.1 The Contestability of the Liner Market

According to the history of the development of the liner conference system, the purpose of the conference is to avoid destructive price competition in the liner industry. Therefore, it can be inferred that before the conference system was established, liner markets were characterized by severe competition and non-sustainable prices. However, it is necessary to determine if the liner industry is still contestable with the existence of conferences. Tested on the five conditions of a perfectly contestable market laid out in the preceding section, the liner industry is found to be highly contestable but not perfectly contestable for three reasons.

First, there exists a history of frequent entry and exit in liner markets. Although there are entry barriers set up by the conference, potential entrants can, nevertheless, enter the liner trade freely as independents or non-conference lines. Moreover, the entry to the liner industry is inexpensively reversible because vessels can be sold or moved from one trade route to another. The exit is not completely costless but the cost is relatively low compared to other industries which involve large "sunk" costs.

Second, the liner market is highly contestable because of the existence of tramp vessels which are potential entrants to liner markets. Consequently, it can be said that contestability exists in the liner market notwithstanding the presence of the conference structure.

Finally, however, the liner market is not perfectly contestable because it does not satisfy three properties possessed by perfectly contestable markets. Firstly, the demand side of the liner market is restricted by the conferences' loyalty contracts. Secondly, the potential non-conference lines are not free of fear of retaliatory price changes by the incumbent conference lines. As a result, potential entrants, in some cases, can be discouraged by the presence of strong conferences. Thirdly, the conference is not obliged to continue to serve all markets (trades). It can choose to abandon selected markets which become unprofitable in the presence of entry.

5.2.2 The Nature of the Conference

By definition, a shipping conference consists of two or more vessel operators, therefore, its structure is basically oligopolistic. Nevertheless, because the conference adopts a uniform price system and eliminates price competition, it is generally regarded as a cartel or a monopoly. In this section, the nature of the conference is analysed on the basis of the cost concept developed by Baumol et al in the determination of industrial structure in contestable markets.

The necessary condition of a "natural monopoly" as defined in the theory of contestable markets is that the industry's cost function is strictly subadditive at any and all levels of output. Specifically, a single firm in a contestable market is considered a natural monopoly if and only if it can produce the output less expensively than any combination of smaller firms. Therefore, taking the conference as a single firm or unit, the question of whether the conference has a monopoly cost structure depends on whether the conference by means of rationalization represents the cost-minimizing structure in the liner industry.

On certain liner trade routes, such as the liner container operations on the Canada-North Atlantic route, subadditivity has led to the merger of several conference lines. For instance, the St. Lawrence Co-ordinated Service (SLCS) was established in 1981 by the merger of CP Ships, Dart Canada, and Manchester Lines. More recently, the Canada Line (now Canada Maritime) has resulted from the partnership of CP and Compagnie Maritime Belge. These joint liner services are said to save more than $14 million in annual operating expenses, for example, the crew, fuel, and port charges.[24] Consequently, it would seem that the liner cost function is subadditive for certain levels of output. However, this conclusion of subadditivity can only be applied locally on particular routes rather than globally to all liner markets across the North Atlantic.

The liner industry may not have strictly subadditive cost structures because a conference may cover trades between a wide range of ports and routes, therefore, it is more efficient and less costly for conference members to rationalize services rather than merge into a single large firm.

However, as David S. Evans and James J. Heckman point out, "subadditivity of the firm cost function is a necessary and sufficient condition for natural monopoly only when all firms have access to the same technology and when market coordination between separate firms is unable to achieve the same economies as internal coordination within a single firm. These assumptions may not characterize many real-world industries."[25] The conference system allows its members to exploit unitedly the relevant economies of scale and scope, thus, it reduces wasteful misallocation of resources that would be created should each independent line explore its own economies of scale and compete destructively. Consequently, an efficient conference can be a natural monopoly based on the concept of subadditivity in a broad sense (i.e. weakly subadditive), for the total cost of liner service could be higher without the conference system.

However, in view of the facts that liner markets have been depressed by overcapacity, and that outsider penetration of major conference trades has grown substantially in the past few years, the subadditivity for liner conferences is not proven. In other words, liner conferences do not represent the minimum cost structure in the liner industry. This may well be the reason as to why the liner market is inherently unstable despite conferences.

5.2.3 The Sustainability of the Conference System

Since historically conferences were formed to avoid destructive price competition in liner markets, it can be said that the industry configuration of the liner trade is basically unsustainable. The unsustainability is caused by several factors. Firstly, liners have the obligation of providing regular and frequent services on specific routes, which tramps do not have. Secondly, liners carrying general cargos are highly vulnerable to competition from special vessel operators. Thirdly, intertemporal unsustainability is a common problem in the liner industry. While the incumbent line maintains excess capacity for a growing market, he can be undercut by an entrant who only concentrates on the short-run demand and supply. Fourthly, the unsustainability of the liner industry is largely due to unfair competition between multinational firms; not only do these firms purchase labour, material, and capital in different markets where equilibrium prices are different, but also some lines are state-owned and subsidized. Finally, in addition to the four major reasons given above, there are also numerous exogeneous variables that may influence the demand and supply situation of the liner market. Consequently, no sustainable price vector is available to the liner industry.

The stability of liner prices is largely achieved by the conference system. On certain trade routes where only one conference provides the liner shipping services, the uniform conference rates are maintained by all member lines. On other trade routes where both conference and non-conference lines operate, the non-conference lines usually follow the conference as a leader in pricing. Therefore, in normal circumstances, the conference prices prevail in the liner market.

However, recently it has been seen that conference rates may become unsustainable under the challenge of non-conference lines. The unsustainability may be an "intertemporal" problem. However, analyses presented in earlier chapters also show that conferences have not been efficient enough to maintain rate stability in liner markets.

To sum up, the liner market is highly contestable, notwithstanding the existence of the conference system. The subadditivity for liner conferences is not proven, although an anecdotal evidence is presented to show that certain liner markets are subadditive. The recent rate wars have shown that liner markets are not sustainable, therefore, liner conferences may be desirable. However, most importantly, conferences must operate efficiently, e.g., minimizing cost through rationalization and establishing sustainable prices, etc., in order to maintain stability in liner markets.

Chapter 6

AN EMPIRICAL ANALYSIS OF THE STRUCTURE OF LINER RATES

The main objectives of this empirical liner rate structure analysis are to find the major determinants of liner rates and to test a set of hypotheses laid out in the preceding chapter.

The analysis covers the freight rates of eight conferences, of which four conferences operate on the Canada-North Atlantic routes, and the other four operate between both the East and West Coasts of Canada and Japan. Table 6.1 shows the two major trade areas and the conferences involved.

The methodology used is multiple regression analysis in both the simple and log-linear forms. Although the methodology used for constructing the rate structure models of all the eight conferences is basically the same, the designs of the models for the conferences in the two major trade areas are somewhat different because the data sources used for the North Atlantic trades are different from those for the Canada and Japan trades.

For conferences on the North Atlantic route, a more detailed rate structure model is developed because an analysis of shipping traffic on this route is performed. Based on the results of the traffic analysis, some important explanatory variables of rates, such as total volume of an individual commodity, number of shipments, average weight per shipment, seasonality of the commodity, competition from non-conference lines, etc., are obtained and included in the liner rate structure models.

However, in the Canada-Japan trades, a simpler model using only volume, stowage factors, and unit value of the commodity as independent variables is adopted due to the lack of time and resources to perform a detailed traffic analysis on these trade routes.

The scope and time periods adopted in the rate models of the two separate trades are also different. Since a rate reform was carried out by the North Atlantic conferences in 1983, separate sets of rate structure models were constructed based on 1982 and 1983 rates, respectively, in order to examine the effect of the rate reform on the structure of liner rates on this route. On the other hand, the analysis of the liner rate structure in the Canada-Japan trades is based

Table 6.1

TRADE ROUTES AND CONFERENCES INCLUDED IN THE EMPIRICAL ANALYSIS OF THE STRUCTURE OF LINER RATES

Trade Areas	Routes	Conferences
(1) North Atlantic		
Export	East Coast Canada to U.K.	Canada-United Kingdom Freight Conference
	East Coast Canada to Continental Europe	Canadian Continental Eastbound Freight Conference
Import	U.K. to East Coast Canada	Canadian North Atlantic Westbound Freight Conference
	Continental Europe to East Coast Canada	Continental Canadian Westbound Freight Conference
(2) Canada-Japan		
Export	West Coast Canada to Japan	Pacific Westbound Freight Conference
	East Coast Canada to Japan	East Canada/Japan Freight Conference
Import	Japan to West Coast Canada	Japan/Korea-West Canada Freight Conference (JKWCFC)
	Japan to East Coast Canada	Japan/Korea-East Canada Freight Conference Eastbound Intermodal Tariff No. 1*

* A separate intermodal tariff published by JKWCFC.

on 1982 data only, since the conferences in these trades have not changed their traditional weight/measurement-based rate system. However, because a separate intermodal tariff for cargos shipped from Japan to eastern Canada is published by the Japan/Korea-West Canada Freight Conference, the effect of the intermodal rates on the all-water liner rates charged by the Japan/Korea-East Canada Conference is examined by including the intermodal rates charged by the West Coast conference in the rate structure models of the East Coast conference.

The sources of data include conference tariffs, shipping stowage handbooks,[26,27] data tapes on vessel and cargo shipping records obtained from Statistics Canada, and the volumes and values of exports and imports from international trade statistics published by Statistics Canada.

6.1 The Rate Structure of the North Atlantic Conferences

The regression model used for the analysis of the liner rate structure on the North Atlantic route is specified as below:

$$P = f(Q, NS, AW, SF, VAL, VOY, NC, D)$$

where P = represents the dependent variable, the commodity freight rate per tonne,
Q = total tonnes of the commodity carried by conference lines in 1982,
NS = number of shipments,
AW = average weight per shipment,
SF = stowage factor of the commodity,
VAL = value of commodity per tonne,
VOY = number of voyages on which the commodity was carried during the year 1982,
NC = total tonnage of the commodity carried by the non-conference line on the route,
D = dummy variable used to represent temperature controlled cargos.

The method of estimation of the straight linear form is:

$$P = \beta_0 + \beta_1 Q + \beta_2 NS + \beta_3 AW + \beta_4 SF + \beta_5 VAL + \beta_6 VOY + \beta_7 NC + \beta_8 D + u$$

and the formula of the log linear form is:

$$P = Q^{\beta 1} NS^{\beta 2} AW^{\beta 3} SF^{\beta 4} VAL^{\beta 5} VOY^{\beta 6} NC^{\beta 7} e^{z}$$

where

$$Z = \beta_0 + D + u$$

where u is the error of estimation, and β_0 represents the constant term.

Great effort has been taken to select an unbiased sample of liner cargo and rates. Specifically, breakdowns of liner commodities at the three digit SCC code were obtained by analysing the manifests of 48 inbound and 49 outbound vessel voyages in 1982. As a result, 350 outbound and 380 inbound commodity groups were identified. However, a large number of these commodity groups were excluded from the rate structure model due to the unavailability of any one of the three major variables, namely, the liner rate, the unit value, and the stowage factor of the commodity.

The unit value of a commodity is calculated by dividing the value of an export by its quantity based on external trade data. Where the quantity is missing or the unit of volume cannot be converted to tonnes, such as the units in numbers, pairs, square yards, etc., the unit value per tonne cannot be calculated and the commodity is dropped. Unfortunately, these unconvertible quantity units appear most often in two major liner cargo groups, namely, "fabricated materials" and "end products".

Consequently, after excluding commodities with missing unit values, only about 120 commodities remain. However, the number of observations is further reduced as a result of not being able to find rates or stowage factors.

The most difficult task in constructing the rate structure model is to extract data on dependent and independent variables from different sources and to match them. The problem of matching data is formidable due to different commodity classifications in each source. And the fact that a sample commodity has to be dropped because of the lack of an observation in any of the variables is often frustrating. Therefore, it is understandable why most of the existing empirical work on liner rate structure analysis contains less than 50 observations while the tariffs of conferences contain hundreds of commodity rates.

In this study, the number of observations included in the rate models of the North Atlantic conferences range from 54 to 88. They are shown with the results of the rate models.

However, it is noted that the full model described above is just a theoretical construction; statistically not all of the independent variables can be included in the linear equation because of the problem of multicollinearity. For example, two of the independent variables, the volume and the number of shipments of a commodity, are usually highly correlated. One of the major problems of multicollinearity is that a positive relationship between the dependent and independent variable turns out to have a negative sign in the estimated equation. Consequently, the independent variables which are prime causes of multicollinearity have to be dropped from the original equation and a number of alternative reduced models are then tested.

However, theoretically, the eight independent variables listed above all have some influence on rate determination. And this is proven by the analysis of the partial correlation coefficients between the dependent variable and the independent variables. It is worth noting that the correlation matrices developed separately for the four North Atlantic conferences all have consistent results in terms of the positive or negative correlation of each independent variable with the liner rates. Therefore, for the purposes of a brief discussion, only the results of one inbound and one outbound conference are presented here as examples.

Tables 6.2 and 6.3 show the partial correlation coefficients between the dependent variable and the independent variables calculated on the basis of data from the Canada-U.K. Freight Conference and the Continental Canada Westbound Conference, respectively. The figures in the upper-right triangle represent the correlation coefficients between the Y and the X's and the figures of the lower-left triangle represent the relationships between the log Y and log X.

As shown in the two tables, the conference rate is positively correlated with the stowage factor, the unit value, and the dummy variable. This means higher rates for high value, bulky, and temperature controlled commodities. On the other hand, the relationship between the rate and the set of independent variables including volume, number of shipments, average weight per shipment, the degree of non-conference competition and the frequency of shipments of a commodity is negative. Thus, the statistical results are in accord with the theoretical assumptions of relationships between the rate and these independent variables.

Table 6.2

PARTIAL CORRELATION COEFFICIENTS
LINER RATE STRUCTURE MODELS, CANADA-U.K. FREIGHT CONFERENCE (N = 59)

Variables	Rate	Volume	Shipment	Average Weight	Stowage Factor	Value	Non-Conference Volume	Voyage	Dummy
Rate	1	-0.03951	-0.01557	-0.12805	0.43194	0.27253	-0.16045	-0.01261	0.74898
Volume	-0.12313	1	0.99559	0.25910	-0.08431	-0.15558	0.66293	0.52746	-0.10027
Shipment	-0.12176	0.94777	1	0.23864	-0.06813	-0.14669	0.65466	0.54993	-0.10099
Average Weight	-0.09076	0.71608	0.46119	1	-0.07052	-0.27628	0.23036	0.22642	-0.03064
Stowage Factor	0.47512	-0.22055	-0.26545	-0.08349	1	0.11781	-0.03617	-0.11614	0.28438
Value	0.23838	-0.17536	-0.08217	-0.34365	0.14447	1	-0.13080	0.00321	0.11845
Non-Conference Volume	-0.32533	0.68097	0.69474	0.37540	-0.31298	-0.20832	1	0.44551	-0.11168
Voyage	-0.00322	0.88524	0.92536	0.43593	-0.10079	0.01994	0.66501	1	-0.06204
Dummy	0.59774	-0.06065	-0.09707	0.04454	0.23829	0.10600	-0.43495	-.03818	1

Note: The correlation coefficients in the upper-right triangle are calculated using the absolute values of the dependent and independent variables, while those in the lower-left triangle are based on the logarithmic values of these variables.

Table 6.3

PARTIAL CORRELATION COEFFICIENTS
LINER RATE STRUCTURE MODELS, CONTINENTAL CANADA WESTBOUND CONFERENCE (N = 88)

Variables	Rate	Volume	Shipment	Average Weight	Stowage Factor	Value	Non-Conference Volume	Voyage	Dummy
Rate	1	-0.11050	-0.12368	-0.20268	0.19039	0.18767	-0.09412	-0.13534	0.42630
Volume	-0.14900	1	0.90002	0.30753	-0.32241	-0.22391	0.79558	0.59012	-0.09172
Shipment	-0.13077	0.91860	1	0.07904	-0.25666	-0.14282	0.72335	0.67469	-0.09990
Average Weight	-0.08623	0.58674	0.22121	1	-0.36356	-0.33712	0.23851	0.11282	-0.07146
Stowage Factor	0.19242	-0.32501	-0.20250	-0.37079	1	0.21239	-0.26238	-0.13235	0.17141
Value	0.12712	-0.24082	-0.09035	-0.40111	0.23354	1	-0.18173	-0.15053	-0.05095
Non-Conference Volume	-0.08851	0.73445	0.66146	0.46539	-0.31208	-0.27367	1	0.40801	-0.10767
Voyage	-0.07686	0.86182	0.93724	0.20581	-0.12428	-0.05938	0.61431	1	-0.07023
Dummy	0.41431	-0.04455	-0.03796	-0.02732	0.17749	0.06476	-0.19126	-0.00664	1

Note: The correlation coefficients in the upper-right triangle are calculated using the absolute values of the dependent and independent variables, while those in the lower-left triangle are based on the logarithmic values of these variables.

Generally speaking, the relationships between the rate and volume and number of shipments are stronger in logarithmic terms, which means that rate changes are affected more by major percentage changes in the quantity variables than changes in absolute tonnage. The same can be said for the relationship between the rate and the stowage factor, a cost variable. However, the rate seems to be linearly correlated with the value of the commodity.

In the rate models of outbound conferences the coefficients of determination (R^2) are statistically significant, which indicates that a large portion of the variation in rates can be explained by the independent variables of the models. However, in the inbound rate models, the "goodness of fit" test indicates that only a very small fraction of the variation in rate is explainable by the independent variables.

The results of the rate structure regression models of conferences providing liner service between eastern Canada and the United Kingdom and continental Europe in 1982 are presented in Table 6.4. Both the linear and log-linear models are shown in the table for the purpose of comparison, although generally speaking the linear models have a higher R^2. The rate structure models presented here are the ones with the highest R^2 among a number of regression models tested.

Several important points can be made from the table. Firstly, the results indicate that the freight rates per tonne are approximately equal to the average costs of liner transport on each leg or route of the North Atlantic trades. This is concluded from the fact that the constant is highly and consistently significant in all rate models. This finding is very important as it is consistent with the contestable market theory that the price charged by a monopolist must be equal to the average cost in contestable markets.

The dummy variable is the only other variable (aside from the constant term) significant in all rate models. It reflects different average costs between dry and refrigerated or hazardous cargos.

Secondly, the stowage factor is found significant in outbound rate models but not in inbound rates. This indicates that in outbound conferences the variations from the average freight rate can be partly explained by the differences in stowage factors of each commodity, while in inbound trades, the average cost, rather than the individual cost of a commodity, is the major determinant of rate levels.

Thirdly, the results do not prove that the value of a commodity is a significant factor in conference pricing. This is in contrast to the results from I. Bryan's studies.[28] Bryan has produced two sets of regression models of liner

Table 6.4

SUMMARY OF LINER RATE STRUCTURE MODELS OF THE NORTH ATLANTIC CONFERENCES

Dependent Variable: 1982 Liner Rates per Tonne

Independent Variable Equations	Constant	Volume	Ship.	AW	SF	Value	NC	VOY	Dummy	N	R^2	F
A. **Straight Linear Model**												
U.K. Outbound	58.86* (4.75)	.0001 (1.862)			.568* (3.098)	.004* (2.299)	-.001 (-1.771)		139.94* (7.99)	59	.67	21.91
U.K. Inbound	144.29* (10.287)		.034 (.943)	-.045 (-.186)	-.136 (.838)	.0004 (.521)		-.575 (-1.448)		69	.05	.65
C.E. Outbound	76.18* (6.86)	-.002* (-2.01)			.3321 (1.758)	.001 (.92)		-.217 (-.671)	128.48* (9.278)	54	.75	26.83
C.E. Inbound	134.9* (4.81)	.006 (1.05)	-.063 (1.04)	-2.0 (-1.37)	.118 (.41)	.002 (1.57)	.0003 (.12)	-.204 (-.36)	107.108* (4.15)	88	.26	3.42
B. **Log Linear Model**												
U.K. Outbound	3.262* (6.299)	-.064 (-1.49)			.269* (3.557)	.034 (.659)		.147 (1.686)	.854* (5.118)	59	.52	11.42
U.K. Inbound	4.937* (13.195)	.038 (.609)		-.024 (-.339)	-.052 (-.846)	.029 (.992)	-.002 (-.097)	-.108 (-1.151)		69	.09	.93
C.E. Outbound	3.616* (9.88)	-.019 (-.682)			.227* (2.935)	.029 (.836)	-.014 (-.503)		.7412* (5.558)	54	.64	16.86
C.E. Inbound	4.376* (10.84)		-.08 (-1.06)		.055 (.69)	.025 (.70)		.105 (.80)	.622* (3.86)	88	.21	4.26

(1) U.K. = United Kingdom, C.E. = Continental Europe.
(2) * Significant explanatory variables based on t ≥ 2.

rates of outbound North Atlantic conferences, one based on 1969 data and the other on 1974 data. Both sets of freight rate models show that the regression coefficient for the unit value was statistically significant. However, the results indicated that on the North Atlantic routes, price discrimination reflected in the conference rate structure decreased in 1974 compared to that in 1969, and Bryan attributed this to "a decline in monopoly power due to increased competition from non-conference carriers". Therefore, it is possible that the rate wars on the North Atlantic have significantly affected the conferences' value-of-service pricing. For, during the fierce competition, the conference lines had complained that the non-conference lines "creamed-off" their high revenue cargos, and the conferences had retaliated. Moreover, the rates for high-value containerized commodities have been greatly affected by intermodal rates. Consequently, the results confirm the economic theories that price discrimination is not sustainable in highly competitive markets and that the Ramsey optimal set of prices will not be sustainable if the monopoly does not have a strictly subadditive cost function or is susceptible to intertemporal unsustainability.

However, the fact that the unit value still has a positive relation with the rate, although not significant, indicates that the pressure of competition may have reduced but not totally eliminated the price discrimination which existed in the traditional "what the traffic will bear" tariff. And it is possible that the conferences may re-introduce the value-of-service pricing in future rate adjustments after they regain their monopoly power by defeating the non-conference lines.

Fourthly, the rate models indicate that volume and size of shipment are not significant in the explanation of rate variations between commodities. This may be because large shippers with high volume cargos can obtain a discount of rates by signing patronage contracts with the conference. Moreover, in some cases, lower rates for high volume are explicitly specified in the conference tariffs.

Fifthly, the relationship between the conference rate and the volume carried by non-conference lines is negative but not significant. This indicates that the freight rate will be lower if a larger quantity is shipped by non-conference carriers. However, in the sample, the variation of the freight rate cannot be significantly accounted for by the variation in non-conference volumes.

Finally, the same conclusion can be applied on the voyage variable. By and large, the regression coefficients for this variable are negative but not significant. Thus, whether the same commodity appears in every vessel voyage is of no importance in conference rate determination.

6.2 The Effect of Rate Reform on the Structure of North Atlantic Conference Rates

Table 6.5 shows the rate models constructed based on the new 1983 commodity box rates. Two new independent variables are included in these models; one is the rate for 1982, and the other is the density of the commodity. The density variable is defined as kilograms (kg) per cubic meter, which is the reverse of the stowage factor. Because the capacity of a container is fixed, the density variable is used to replace the stowage factor in the structure model of commodity box rates.

Again, the outbound rate models have much better explanatory power than the inbound rate models, and the linear model fits better than the logarithmic model.

In outbound conferences, the new commodity box rates are found positively and significantly related to the previous year's weight-based commodity rates. The R^2 of the rate models of the Canada-U.K. and Canada-Europe conferences are 0.78 and 0.76, respectively, which indicates that variations in commodity rates are retained largely in the CBR system.

However, on the inbound routes, the relationship between the CBRs and commodity rates is positive but not statistically significant. Instead, rates of inbound containers from the U.K. are positively and significantly related to the value of the commodities. Thus, the value-of-service pricing is, to a certain extent, preserved in the new conference tariff. Moreover, the density factor is a significant variable in explaining rate variations on inbound routes, which implies that the commodity box rate is affected by the weight of a commodity that can be stuffed in a container.

In addition, the constant, or average cost, is consistently a significant factor in the determination of the level of 1983 commodity box rates, as it was in the models of 1982 rates. However, in the rate models, volume in tonnes and size per shipment have little influence on CBRs. This may be explained by the fact that volume discounts usually appear in special provisions of the tariffs.

Finally, the new rate models do not establish a significant relationship between CBRs of conferences and the tonnage carried by outsiders. This may be due to the fact that the CBRs sampled in this study are port-to-port rates, while the major impact of outsiders' competition is on the door-to-door intermodal rates.

Overall, the structure of the commodity box rate in terms of its determinants is not much different from the structure of the commodity weight system.

Table 6.5

SUMMARY OF LINER RATE STRUCTURE MODELS OF THE NORTH ATLANTIC CONFERENCES

Dependent Variable = 1983 Liner Commodity Box Rates

Independent Variable / Equations	Constant	Rate '82	Volume	Ship.	AW	DEM	Value	MC	Voy	Dummy	N	R^2	F
A. Linear Models													
U.K. Outbound	969.1* (4.842)	7.864* (5.476)			-13.929* (2.034)		.003 (.143)		2.0142 (.581)	1 093.67* (3.681)	59	.78	38.20
U.K. Inbound	1 312.84* (2.688)	.436 (.138)	-.008 (-.132)		5.917 (1.213)	9.985* (2.904)	.0779* (2.884)	-.021 (-.837)			69	.54	4.37
C.E. Outbound	810.1* (2.71)	9.239* (4.118)	-.002 (-.102)			.55 (.287)	-.0143 (-.867)	.01 (.624)	-6.094 (-1.298)	1 014.74* (2.862)	54	.76	19.16
C.E. Inbound	1 341.5* (4.681)	1.957 (1.446)		.539 (1.673)	-3.403 (-.289)	4.665* (3.077)	.0176 (1.001)	-.0292 (-1.404)	-9.361 (-1.731)		60	.27	2.76
B. Log Linear Models													
U.K. Outbound	4.452* (8.131)	.617* (7.466)	-.084* (-2.183)			.02 (.377)	.028 (.878)			.34* (2.71)	59	.77	35.37
U.K. Inbound	5.908* (5.479)	-.038 (-.183)			-.125* (-2.282)	.418* (4.296)	.064 (1.306)		.014 (.29)		69	.26	4.36
C.E. Outbound	5.259* (5.59)	.458* (3.043)	.0816 (1.902)			-.011 (-.122)	.004 (.114)	-.04 (-.1397)	-.106 (-1.46)	.415* (2.27)	54	.60	9.26
C.E. Inbound	5.95* (7.997)	.14 (1.191)	-.019 (-.224)		-.026 (-.262)	.236* (3.019)	.014 (.279)	-.01 (-.32)	-.007 (-.043)		60	.17	1.53

* Significant explanatory variables based on t ≥ 2.

6.3 The Liner Rate Structure Models of Canada-Japan Trade Routes

In the Canada-Japan trades, sample liner cargos are selected based on the commodity value in 1980 external trade data. Commodities whose imports or exports were over a $1 million threshold are included in the study.

A simpler rate model as compared to the ones constructed on the North Atlantic route is specified for Canada-Japan conferences. The model includes four independent variables, namely, volume, stowage factor, unit value, and the dummy (service) variable. The model is written as:

$$P=f(Q,SF,VAL,D)$$

Both linear and log-linear equations are estimated based on the Ordinary Least Squares Method. The results of these rate models are shown in Table 6.6. The goodness of fit (R^2) of the rate structure models in Canada-Japan trades range from 0.72 to 0.94. The linear models are generally better than the log-linear models except in the case of rates on Japan to East Canada trade routes. For the purpose of comparison, the results of both types of models are included.

The signs of the regression coefficients are consistent with the a priori assumptions that the relationship between rate and volume is negative and those between rate and unit value, stowage factor, and dummy service variables are positive.

In general, the results are similar to those obtained from North Atlantic rate models except for two major observations. First, the unit value of a commodity seems to play a more important role in the determination of rates in the Canada-Japan trades than of the rates on North Atlantic routes. Second, the intermodal rates, which represent through rates of imports from Japan to Canada's West Coast then by rail to eastern Canada, have a great impact on the rates of the all-water Japan to eastern Canada services. Because of its importance, the effect of intermodal rates on water rates is measured separately from other independent variables. The result shows that above 87% of the variations in water rates can be explained by the variations in intermodal rates. In Table 6.6, if the two equations for the East Coast inbound route were combined, the intermodal rate together with other independent variables could explain more than 90% of the variations in Japan to East Coast Canada rates.

6.4 Conclusions

In summary, the above rate models were used to assess the relationship between liner rates and a set of cost and

Table 6.6

CANADA-JAPAN TRADES
SUMMARY OF RATE STRUCTURE MODELS

Dependent Variable = 1982 Liner Conference Rates

Independent Variable Equations		Constant	Intermodal Rates	Volume	Stowage Factor	Unit Value	Dummy	N	R^2	F
A. Linear Models										
West Coast Outbound		72.2 (1.25)		-.0001 (-.153)	1.189 (1.383)	.025 * (4.068)	162.0* (4.137)	23	.72	11.35
West Coast Inbound		104.86* (7.99)		-.00002 (-.6741)	-.057 (-.249)	.002* (2.692)	385.16* (19.623)	29	.94	101.38
East Coast Outbound		119.32* (4.09)		-.0011 (-1.582)	2.007* (3.2)	.0212* (3.665)	96.26* (3.057)	20	.83	18.15
East Coast Inbound	(1)	-24.352* (-2.084)	.851* (12.532)					30	.87	157.04
	(2)	119.43* (8.62)		-.0013 (-1.084)	.0368 (.1732)	.0006 (.3393)		30	.09	.68
B. Log Linear Models										
West Coast Outbound		2.815 (1.371)		-.036 (-.508)	.2802 (.95)	.222* (2.247)	.504* (2.083)	23	.60	6.7
West Coast Inbound		4.811* (7.804)		-.024 (-.705)	-.0162 (-.139)	.012 (.206)	1.466* (6.986)	29	.73	15.82
East Coast Outbound		2.17 (1.469)		-.004 (-.059)	.297 (1.739)	.257* (2.434)	.465* (2.634)	20	.72	9.8
East Coast Inbound	(1)	-1.703* (-3.567)	1.263* (13.551)					30	.89	183.63
	(2)	4.91* (11.79)		-.069 (-1.602)	.149 (1.301)	-.037 (-.781)		30	.16	1.37

Note: The figures in brackets are t values, the independent variable is considered significant (*) when t ≥ 2.

demand variables. Based on the results of the rate models, five theoretical issues or hypotheses were examined and the following conclusions were drawn:

Firstly, the value-of-service pricing assumption is supported by the rate models of conferences serving Canada-Japan trades. The positive relationship between rate and unit value is also found in the North Atlantic trades, but, generally speaking, it is not statistically significant.

Secondly, the assumption of the contestability theory that price should be equal to the average cost in a monopoly structure is largely supported by the rate models.

Thirdly, on the North Atlantic routes, the rate structure of the new commodity box rates is not different from the commodity rate structure before the reform.

Fourthly, the rate models show that competition from non-conference lines has a negative effect on the conference's port-to-port rates but the relationship is not significant.

Finally, as shown in the Japan to East Canada rate model, intermodal rates (i.e., movements involving use of land-bridge or mini-bridge) have an important impact on the all-water liner rates.

Chapter 7

THE LEVEL OF LINER FREIGHT RATES

7.1 The Profitability of the Liner Shipping Industry

As described in Section 5.2, in order to achieve rate stability and sustainability in contestable markets, a monopoly has to adopt entry deterrent pricing and earn zero profit after including entry cost (or rent) in the monopoly's costs. Accordingly, in theory, members of a shipping conference can earn no higher profit than a normal return on capital in highly contestable liner markets. Although it is a widely-held view that profitability in the liner industry has been low, there is a lack of empirical study on liner profitability. Up until now, the most frequently quoted evidence on low returns on liner investment has been the findings of the Rochdale report in 1970.[29]

Recently, in an attempt to fill this gap, B. Gardner studied the rates of return of four major U.K. shipping groups,* based on their published accounts over the period from 1968 to 1981. However, Gardner reached no conclusion as to the profitability of these companies mainly because of the difficulty of separating the return on liner capital investments from the other diversified activities of these companies. Consequently, Gardner assessed the liner profitability solely on the performance of Overseas Containers Limited (OCL) which was jointly owned by the four companies, and stated that "to the extent that OCL is representative of other liner shipping business, we may conclude, at least tentatively, that despite accelerating cost inflation in the 1970's, the post-Rochdale era has been generally a period of improved profitability for liner shipping, and that returns have been satisfactory in comparison to other industries".[30]

A survey of the profitability of shipping companies was also conducted by Heaver.[31] In his study, Heaver obtained the return on net worth before taxes for eight companies engaged in liner shipping from the annual reports of Moody's Transportation Manual over the period from 1967 to 1981. Heaver also developed the normal shipping return based on the rate of return on risk-free U.S. long-term bonds and the average return in the U.S.

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* They are Ocean Transport and Trading Ltd., British and Commonwealth Shipping Company, Peninsular & Oriental Steam Navigation Company, Furness Withy & Company Ltd.

stock market. Although Heaver concluded that, on average, the rates of return earned by the shipping companies were less than adequate, he also pointed out that a wide range of returns were earned by the lines. In fact, the data in Heaver's study show that in some good years, the earnings of a couple of selected shipping companies were well above the normal rate of return. This, however, was offset by the loss incurred in other years.

In the present study, the performance of CP Ships of Canadian Pacific Limited is used to evaluate the profitability of the liner industry in Canadian trades. Table 7.1 shows the net income of CP container operations and bulk shipping, over the period from 1973 to 1983. In the table, breakdowns of total revenue and expense are also available for the years from 1979 to 1983. The net income represents return to equity as interest and income tax are already included in expenses and are deducted from revenue. The data are compiled from the published annual reports of CP Limited.

As shown in the table, during the past eleven years, CP container operations had six profitable years against five years in which losses occurred. Generally speaking, the CP liner container operations were profitable during the period from 1974 to 1980, except a minor loss in 1978; the highest net income yield by the company's liner operation was the $6.5 million earned in 1974.

The 1974 profit was mainly attributable to improved utilization of vessel capacity, while the 1977 growth in profit was a result of an increase of 22% in the volume of containers carried.

In 1979 and 1980, conferences made upward rate adjustments and imposed BAF and CAF; the resulting higher rate level contributed to profit.

The company suffered losses in 1973. As explained in the CP annual reports, the reasons for the poor operating results were labour disruptions on the docks in the U.K. and Canada, a Canadian rail strike and strikes of some major customers, and the delays in securing higher rates to meet rising costs.

The loss in 1978, in contrast to a generally good performance in the late 1970's, was mainly attributed to a decline in traffic which resulted from increased competition, and major strikes that affected customers in both Canada and the U.K. Other factors adversely affecting the company's performance in 1978 included depressed rates due to competition and higher costs caused by inflation, unfavourable exchange rates, and an imbalance between westbound and eastbound traffic flow.[32]

Table 7.1

CP SHIPS CONSOLIDATED INCOME STATEMENT
1973-1983
(in Thousand Dollars)

	1983	1982	1981	1980	1979	1978	1977	1976	1975	1974	1973
Container Operations											
Revenues	139 600	159 900	151 703	144 475	122 545						
Expenses	173 000	162 300	151 921	143 515	121 225						
Net Income	(33 400)*	(2 400)	(218)	960	1 320	(486)	2 700	2 400	1 300	6 500	(3 500)

Note:

* The loss in 1983 includes expenses relating to the company's withdrawal from the U.S. East Coast container service and to re-organization of the Montréal-Western Europe service.

	1983	1982	1981	1980	1979	1978	1977	1976	1975	1974	1973
Bulk Shipping Operations											
Revenues	94 005	110 039	184 500	194 300	133 100						
Expenses	134 898	127 674	140 500	142 900	108 100						
Net Income	(40 893)*	(17 635)	44 000	51 400	25 000	(7 545)	(13 019)	1 198	13 271	12 124	6 614

Note:

* There was a net loss of $10.8 million on sale of a vessel in 1983, in contrast with gains on sales (amounting to $1.7 million in 1982 and $14.1 million) in 1981.

	1983	1982	1981	1980	1979	1978	1977	1976	1975	1974	1973
Bulk Shipping and Container											
Revenues	233 605	269 939	336 203	338 775	255 645	185 582	143 197	118 007	115 043	116 604	63 270
Expenses (includ. income tax)	307 898	289 974	292 421	286 415	229 325	193 613	153 516	114 409	100 472	97 980	60 156
Net Income	(74 293)	(20 035)	43 782	52 360	26 320	(8 031)	(10 319)	3 598	14 571	18 624	3 114
Breakdown of Expenses											
Maintenance	17 836	23 631	26 934	28 824	15 137						
Other Operating	163 197	169 291	178 791	181 965	144 288						
Selling, General, Administrative	71 799	40 961	38 284	34 634	30 531						
Depreciation, Amortization	39 124	38 579	31 197	26 417	22 521						
Interest	18 875	17 433	17 800	13 136	13 202						
Income Taxes	(2 933)	79	(585)	1 439	3 646						
Total Expenses	307 898	289 974	292 421	286 415	229 325						

Source: Based on annual reports of Canadian Pacific Limited, 1973-1983.

Unlike the causes of loss incurred in the 1970's, such as labour disputes, higher costs, etc., the poor performances of liner shipping in the early 1980's, i.e., 1981 to 1983 inclusive, are due to the following reasons:

1) recession of world shipping markets, particularly transatlantic trades;

2) severe overcapacity situation;

3) competition from non-conference lines;

4) as a consequence of the above three reasons, depressed rates; and

5) the development costs of new services.

The loss in 1983, which amounted to $33.4 million, is, so far, the poorest performance of the CP liner operations. However, the loss included $10.7 million relating to the company's withdrawal from the U.S. East Coast service and to re-organization of the Montréal-Western Europe service. Moreover, the U.S. container service accounted for approximately $13 million of the loss. Thus, the actual loss on the Canadian North Atlantic container service was estimated by the company at $9.7 million.

In Table 7.2, the effect of rate levels on liner profitability is examined. The table shows annual rate increases by the Canada-U.K. and the Canadian Continental Eastbound conferences and the operating results of the CP Steamship Ltd. of the period from 1979 to 1982. As CP Steamship operates only on the North Atlantic routes, the rate increases on these routes have a direct effect on the revenue and profitability of the company's liner operation. The data presented in Table 7.2 seem to confirm that the liner freight rates were unremunerative in both 1981 and 1982.

Table 7.2

THE EFFECT OF RATE LEVELS ON THE LINER PROFITABILITY

Years	Annual Rate Increases Canada-U.K.	 Continental Eastbound	Profit of CP Liner Operations
	(Percentages)		($ Thousands)
1979	23	22	1 320
1980	21	16	960
1981	10	4	-218
1982	-8	-10	-2 400

The above analysis shows the reasons for good and bad performances of the liner company. However, the question remains whether in good years the conference line makes excess profit. Therefore, the rates of return of CP Ships are calculated for the profitable years and presented in Table 7.3. However, due to the fact that the CP consolidated balance sheet does not show separately the equity of CP Ships, the equity of the shipping sector is approximated by the difference between its net fixed assets and long-term debt. Consequently, the annual rates of return shown in Table 7.3 are ballpark estimates.

Furthermore, it is not possible to obtain separate data on assets and accumulated depreciation for the two shipping operations in CP Ships, namely, CP Bermuda (bulker) and the CP Steamships Ltd. (liner). Therefore, rates of return of CP liner operation alone cannot be derived. However, the relative profitability between the liner and bulk operations can be compared by the use of Table 7.1 where data on revenues, expenses, and net income of the two operations provide a comparison of net income per dollar revenue earned.

Two sets of annual rate of return to capital are derived. The first is the rate of return to equity which is based on the formula:

$$R_1 = \frac{\text{Net income after interest on debt and income tax}}{\text{Net fixed asset - long-term debt}}$$

The second is the average cost of capital which is calculated only for the years after 1978 when data on interest are available (see Table 7.1) and is based on the formula:

$$R_2 = \frac{\text{Net income after tax + interest}}{\text{Net fixed asset}}$$

Table 7.3

FINANCIAL DATA OF CP SHIPS
1973-1983
(in Thousand Dollars)

	1983	1982	1981	1980	1979	1978	1977	1976	1975	1974	1973
CP Ships Properties at Cost	762 142	758 956	689 285	598 625	534 338	521 481	506 798	427 800	380 637	355 943	273 605
Less: Accumulated Depreciation Depletion and Amortization	192 008	181 061	152 138	126 102	108 393	92 322	76 020	57 949	42 494	29 514	19 720
Net Fixed Assets	570 134	577 895	537 147	472 523	425 945	429 159	430 778	369 851	338 143	326 429	253 885
Long Term Debt											
CP Bermuda	138 434	164 969	129 357	145 326	115 549	132 550	103 881	30 626	26 482	31 850	13 548
CP Steamship Ltd.	25 496	29 649	32 693	666	-	-	1 735	4 089	6 417	13 197	16 268
Total Debt	163 930	194 618	162 050	145 992	115 549	132 550	105 616	34 715	32 899	45 047	29 816
Net Asset Minus Debt (est. equity)	406 204	383 277	375 097	326 531	310 396	296 609	325 162	335 136	305 244	281 382	224 069
Return to Equity (r1)*	-	-	11.7%	16.0%	0.5%	-	-	1.1%	4.8%	6.6%	1.4
Return to Total Net Capital (r2)	-	-	11.5%	13.9%	9.3%	-	-	-	-	-	-

* The rates of return are calculated only for years of profit, see Table 7.1.

Source: Based on annual reports of Canadian Pacific Limited, 1973-1983.

The results show that the highest rate of return to equity is 16%, while the average cost of capital is 13.9% earned in 1980 by CP Ships. However, because the interest rate was high in that year, for instance, the average yield of corporate long-term bonds was about 14%, the rate of return of CP Ships is not considered exorbitant when taking the risk of the shipping business into account. Moreover, in the year 1974 when CP Liner earned the highest profit, the estimated return to equity of CP Ships was only 6.6%; nevertheless, the performance of CP Ships was better than CP Air, CP Trucks, and CP Rail.

In terms of profit per dollar of revenue earned, the liner profit margin seems to be lower than the bulk operation based on the three-year data from 1979 to 1981.

Overall, no evidence of excess profits is found in the analysis of the annual operating results of CP Ships. The financial results of CP container service indicate that the liner profitability is subject to the influences of various demand and supply factors. Despite rising costs and the weak Canadian dollar, the company's liner shipping arm was able to earn positive returns on investment in the middle and later 1970's. However, as a result of three consecutive years of losses in the early 1980's there were almost as many years of losses as years of profits during the period studied. Thus, it seems true that shipping conference members, or the conference as a whole, must also meet a set of behaviour rules such as efficiency and sustainable prices in order to maintain the stability of conference rates and the monopoly of the conference in contestable liner markets.

7.2 Comparison Between Conference and Non-Conference Rates

Lower freight rates and economies of scope were the two main advantages used by major outsiders to compete with conference lines in the early 1980's. Available data show that the freight rates charged by conferences serving Canadian trades on the North Atlantic routes ranged from $740 to $960 per TEU while the rates of outsiders ranged from $500 to $550 in U.S. dollars.[33] Moreover, the independents, such as Cast, concentrated on the intermodal services and offered "point-to-point", "point-to-port", and "port-to-port" lump sum rates, which led to great success before conferences retaliated with their own intermodal rates.

During the rate war, Cast's rates were dropped to a point that was unprofitable and unremunerative, which eventually caused severe financial problems and resulted in the takeover of the company by the Royal Bank of Canada. In late 1983, when Cast (1983) Ltd. was reorganized, the shipping line imposed an increase of 33% on the company's door-to-door container rates.[34] Thus, the instability of rates set by outsiders is probably the main reason, apart from the loyalty contract, why regular liner customers continued to use the service of conference lines even when the rates of the latter were higher.

In Table 7.4, the commodity door-to-door rates quoted by Cast (1983) Ltd. are compared with those charged by the Canadian Continental Eastbound Freight Conference. The figures are from the last quarter of 1983, that is, before Cast became a member of the conference. The data are taken from tariffs filed with the CTC. The tariff of Cast was in U.S. dollars and did not apply a currency adjustment factor. Therefore, a conversion factor of 1.25 which is based on the average exchange rates of the period, is applied to convert Cast rates to Canadian dollars. As shown in the table, the 11 commodity box rates were selected on the basis of similar intermodal services. Generally speaking, the Cast rates were lower than the conference rates. However, it is noted that the rate gaps between the conference and non-conference lines were much narrower in late 1983 than those experienced during the rate wars. In this sample, only in two commodities, rugs and asbestos, were the conference commodity box rates lower than Cast's rates. However, these conference rates were subject to CAF and terminal service charges. Therefore, the total liner cost of conference service was not lower than the cost of service by the non-conference line.

7.3 Liner Cost and Rate Levels

In order to assess whether the liner rate levels are high or low, it is necessary to compare rates with shipping costs. However, because data on actual shipping expenses are not readily available, cost items on an ocean voyage often have to be estimated.

Liner cost estimates are available in two recent studies, one by S. Gilman[35], and the other by P.I. Georges.[36] First, Gilman has examined the economies of scale of different sizes of vessels by estimating costs per TEU miles for a range of cellular container ships. Ship costs per TEU in port and at sea are estimated separately; the former is related to ship size, daily operating cost in ports, and cargo handling rates, and the latter is mainly related to ship size and speed. Second, in an internal report prepared for the Research Branch of the CTC, Georges has developed estimates of vessel costs and total voyage expenses based on the operation of a container vessel on the Canada-North Atlantic route in 1984.

The Georges cost study facilitates a comparison between liner costs and rates on the Canadian North Atlantic trade route. In his study, the voyage expenses include vessel costs (fixed charges), fuel, cargo handling charges, port charges, and container operating costs. Vessel costs include labour, materials, and capital costs of a container vessel with the capacity of carrying 1 800 TEUs. Cargo handling and port charges

Table 7.4

COMPARABLE COMMODITY RATES QUOTED BY CAST AND CANADIAN CONTINENTAL EASTBOUND FREIGHT CONFERENCE
(Last Quarter 1983)

Commodity	Movement**	Container Size	Cast Rate US$	Cast Rate* Converted to CDN$	Conference Rate Canadian $
Milk, concentrated	H. Toronto to T. Antwerp	20 ft.	1 100	1 375	1 425 (1)
Peas, lentils	H. Ontario Points to T. Continental Base Ports	20 ft.	925	1 156	1 200 (1)
Liquor	T. Montréal to T. Antwerp	20 ft.	789	986	1 300 (2)
Oil seeds	T. Montréal to T. Continental Base Ports	20 ft.	375	467	575 (3)
Wood pulp	T. Montréal to T. Antwerp	20 ft.	300	375	725 (3)
	T. Bremen	20 ft.	575	719	725 (3)
Rugs	H. Burlington to H. Tilburg	40 ft.	1 525	1 906	1 575
Asbestos	T. Montréal to T. Antwerp	20 ft.	575	719	713
		40 ft.	900	1 125	1 338
Talc	T. Montréal to H. Ludwigshafen	20 ft.	1 000	1 250	1 290 (4)
Scrap metal, n.e.s.	T. Montréal to T. Antwerp	40 ft.	1 050	1 313	1 340 (3)

(1) EXCL CONT Terminal Service Charge (TSC)

(2) INCL CONT TSC and Currency Adjustment Factor (CAF)

(3) INCL CDN and CONT TSC and CAF

(4) INCL CDN TSC and CAF

* A conversion factor of 1.25 is used to convert U.S. dollars to Canadian dollars based on the average exchange rate of the period.

** H = House; T = Terminal

Source: Tariffs published by Cast and Canadian Continental Eastbound Freight Conference, respectively.

in the ports of Montréal and Felixtowe are developed based on actual operating costs. However, the Felixtowe costs are used for estimating port charges in the other three European ports, namely, Hamburg, Antwerp, and Le Havre. As these costs were in different currencies, they were converted to U.S. dollars at the exchange rates of 1984.

The estimated total voyage cost, however, does not include the cost of selling or marketing of the ship services. Moreover, the cost is calculated based on the assumption of full load. Although, it is recognized in the cost study that the eastbound sailings are booked with approximately 70% capacity, the redundant slots are assumed to be taken up by empty containers returning to Europe. Thus, the estimated unit cost per TEU represents the average cost per TEU slot, or the marginal cost of a vessel voyage.

Overall, the results of the cost study show that the voyage cost per TEU on the North Atlantic route is U.S. $522.52, which in Canadian dollars, is estimated at $679.28 per TEU.

In order to compare the estimated liner cost per TEU with liner rates, the 1984 tariffs of two outbound conferences serving Canada-U.K. and Canada-Continental Europe trades are analysed. Specifically, a survey of all port-to-port container box rates in the two conference tariffs is conducted. As discussed earlier in Chapter 4, the conference commodity rates are widely dispersed. Consequently, a total of 1 306 commodity box rates were surveyed. The statistical summary of these rates is presented in Table 7.5.

Several points are derived from the table. Firstly, the minimum rates per TEU, e.g., $780 to U.K. and $755 to Europe for 20 foot containers, and $600 per TEU for 40 foot containers on the routes, are indeed very close to the estimated cost of $679 per TEU. The difference between the minimum rates and the cost is within 15% of the estimated average or marginal cost. Given the possibility of certain diversions of the real cost situations from the hypotheses used in calculating cost elements, it is reasonable to conclude that the minimum rates are set at the level of the average cost which is equal to or greater than the marginal cost.

Secondly, the maximum rates are much higher than the average cost. However, these rates are only applied to hazardous goods and unspecified general cargos.

Thirdly, the overall average rate is calculated at $1 438 per TEU which is more than double the average cost. However, due to the lack of data on volume of each commodity, the mean rate is calculated by simple average; thus, the average rate may be overestimated because of a few extremely high rates.

Finally, as indicated by the modes of the rate distributions, most commodity rates are at the range of $900 to $1 180 per TEU. Thus, generally speaking, rates are well above the minimum average cost. However, this may be due to the fact that the load factors of vessels fluctuate during a year. Therefore, the overall average cost may be much higher than the average cost per TEU calculated on the basis of a full load.

Table 7.5

ANALYSIS OF 1984 LINER CONTAINER RATES ON THE NORTH ATLANTIC TRADE ROUTES

	Canada-U.K.		Canada-Continental Europe		Total
	20'	40'	20'	40'	Rate/TEU
No. of Observations	416	275	358	257	1 306 (1 838 TEU)
Minimum Rates ($)	780	1 200	755	1 200	600/TEU
Maximum Rates ($)	4 618	9 236	4 899	9 798	4 618/TEU
Mean ($)	1 566	2 604	1 564	2 483	1 438/TEU
Median ($)	1 440	2 300	1 480	2 255	
Mode ($)	1 180	1 800	1 080	1 800	
Std. Dev.	521	1 112	545	1 031	
Coef. of Skewness	1.54	1.97	1.77	2.79	
Coef. of Kurtosis	6.94	8.28	8.64	14.64	

Note: (1) The rates are in Canadian dollars.
(2) Rates of 40 foot containers are divided by two to obtain rates per TEU.

Source: Data are obtained from 1984 tariffs of the Canada-U.K. and Canadian Continental Eastbound Freight Conferences. This table includes all port-to-port CBRs under the house-to-house service column.

In summary, the comparison between rate and cost levels on the Canadian North Atlantic route indicates that while the minimum rates for some commodities are close to the estimated average cost based on full loading, average rates are well above the average cost.

Chapter 8

THE EFFECT OF LINER RATES ON CANADIAN INTERNATIONAL TRADES

8.1 Liner Freight Rate Indices

In the study entitled "Shipping Conference Freight Indices for Canadian Export Trade" published by the CTC in early 1984,[37] a set of quarterly liner price indices, with various levels of aggregation, was developed for the period from 1978 to 1981. Moreover, analyses of the liner freight indices, including comparisons between coasts of origin of conferences in Canada, between contract and non-contract rates, and between Canadian and joint Canada-U.S. conferences as well as the impact of BAFs and CAFs on liner rates, were performed in Chapter 5 of the study.

However, since the publication of the above study, the time series of the liner price indices has been updated to include 1982 data. Therefore, three main index tables are included in this section for further analysis and discussion. In particular, Table 8.1 shows the aggregated conference rate index which represents average quarterly rate changes of 17 outbound shipping conferences serving Canadian trades, over the five-year period from 1978 to 1982. This table includes four separate time series of price indices, namely, basic commodity rates, rates including BAF, rates including CAF, and rates including both BAF and CAF. In addition, the variations of aggregated conference indices are shown graphically in Figure 8.1. Tables 8.2 and 8.3 show quarterly liner rate indices by conference, with and without surcharges, respectively. The results are summarized below.

As shown in Table 8.1 and Figure 8.1, strong and persistent upward trends of liner conference rates appeared during the three-year period from the second quarter of 1978 to the second quarter of 1981, due to increases in both commodity rates and in bunker and currency surcharges. However, a turning point occurred in the middle of 1981 as overall liner rates started to decline. The downward trend continued in 1982, which can be attributed to two major factors.

Firstly, starting in the second quarter of 1981, oil and bunker prices had levelled off and declined, as a result, conferences had gradually rolled part of the surcharges into commodity rates. As shown in Table 8.1, there were continuous quarterly increases in the commodity rate index during 1981 and 1982. However, the price index constructed on the basis of

Table 8.1

AGGREGATE QUARTERLY LINER CONFERENCE RATE INDICES FOR CANADIAN EXPORTS
(1st Quarter 1980 = 100)

	Commodity Rates	Rates Including BAF	Rates Including CAF	Rates Including BAF and CAF
1978				
2nd Q	82.43	72.62	75.76	67.71
3rd Q	84.54	74.43	80.29	71.73
4th Q	84.92	74.80	83.07	74.20
1979				
1st Q	88.62	78.45	89.45	80.17
2nd Q	91.51	86.73	92.26	87.86
3rd Q	94.59	93.51	93.64	92.90
4th Q	95.39	94.98	94.66	94.27
1980				
1st Q	100.00	100.00	100.00	100.00
2nd Q	103.03	101.32	102.90	101.38
3rd Q	107.06	103.97	107.31	104.50
4th Q	108.19	106.62	110.28	108.73
1981				
1st Q	112.74	113.95	115.14	116.11
2nd Q	115.58	117.27	116.57	118.20
3rd Q	117.66	116.83	115.62	115.43
4th Q	119.25	114.69	114.57	111.16
1982				
1st Q	124.09	116.62	118.82	112.78
2nd Q	125.86	116.04	120.30	112.25
3rd Q	126.68	116.96	121.10	113.16
4th Q	128.32	116.29	120.11	110.37

Figure 8.1
QUARTERLY LINER CONFERENCE PRICE INDEX
FOR CANADIAN EXPORT TRADES 1978 - 1982
(1st Quarter 1980 = 100)

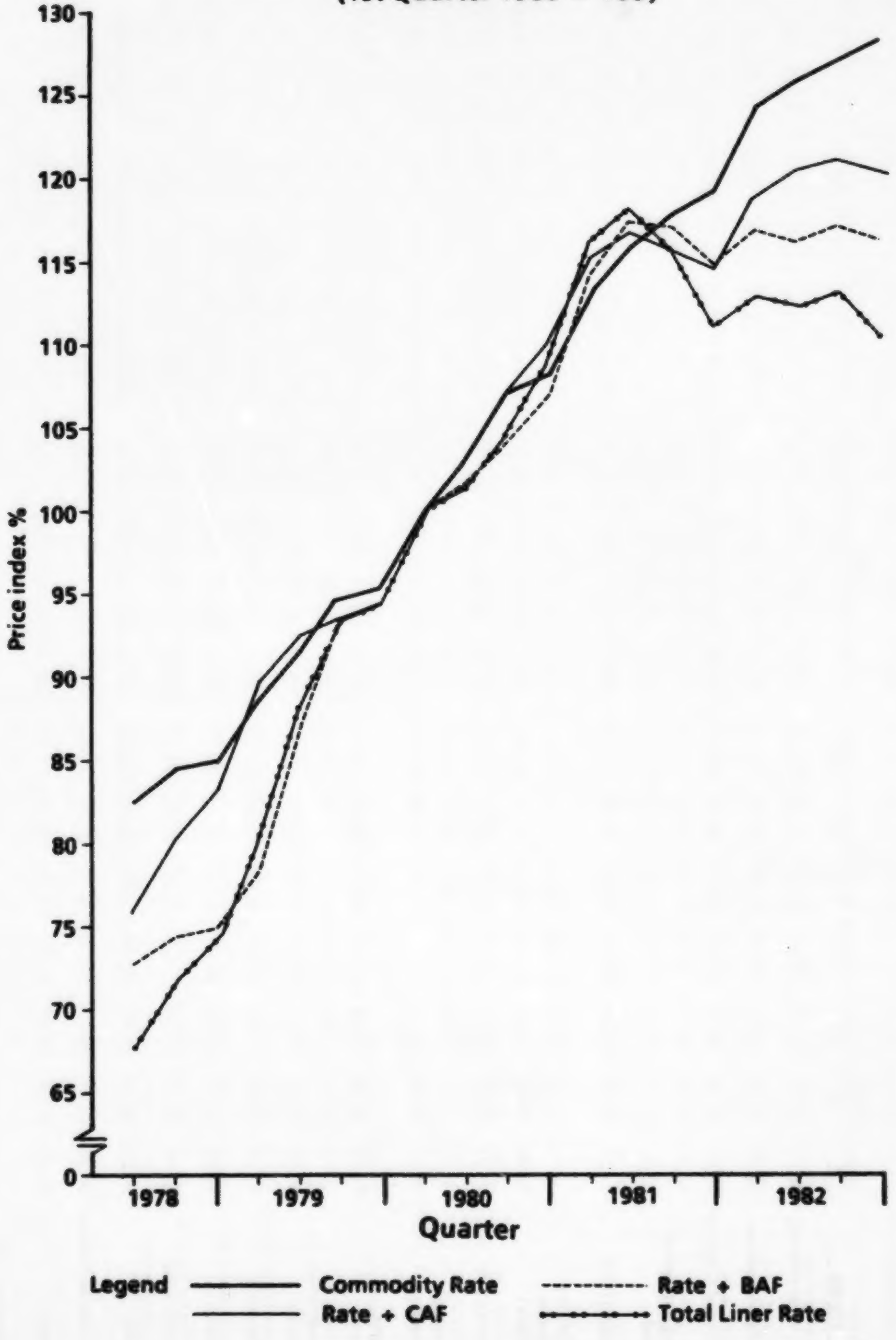

Table 8.2

QUATERLY LINER FREIGHT RATE INDICES BY CONFERENCE

Commodity Rates
(1st Quarter 1980 = 100)

CTC		1978			1979				1980				1981				1982			
No.	Conference	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV
01	American West African	86.80	86.80	86.80	86.80	86.80	100.00	100.00	100.00	103.51	110.52	116.68	119.76	125.40	142.86	142.86	155.59	155.59	155.59	155.59
04	Canada/Mediterranean	85.41	89.01	89.27	90.42	95.34	96.25	99.13	100.00	103.69	107.01	109.21	112.70	115.33	115.36	125.00	131.06	131.16	136.18	136.91
06	Canada/United Kingdom	79.51	79.51	79.53	86.47	86.64	88.95	89.25	100.00	100.03	106.36	106.43	116.62	116.62	120.61	120.61	120.71	121.44	121.53	123.81
07	Canadian Continental Eastbound	82.31	82.34	82.34	87.37	87.36	93.23	93.52	100.00	100.13	106.53	106.55	111.76	111.79	112.57	107.77	104.03	104.54	104.98	108.37
15	East Canada/Japan	81.76	81.76	84.65	89.48	90.89	90.72	90.72	100.00	103.11	105.24	104.11	106.01	109.14	109.45	109.45	116.16	137.37	142.09	142.09
17	Eastern Canada/ Australia and New Zealand	89.30	89.30	89.30	90.03	90.61	97.23	98.09	100.00	106.56	106.52	106.52	115.04	114.95	125.89	131.36	141.34	141.21	141.21	141.21
20	Inter-American-A	73.23	73.23	75.20	81.52	89.20	89.20	97.19	100.00	100.00	100.00	100.00	110.91	112.09	112.09	112.04	115.55	117.35	117.35	117.10
26	Latin American/ Pacific Coast	88.55	91.63	90.77	91.94	91.94	99.80	100.54	100.00	100.00	111.50	114.37	119.09	119.09	126.81	126.81	140.70	140.70	146.90	149.52
30	Pacific Coast Australian	79.40	79.40	79.40	80.86	80.35	88.43	88.43	100.00	107.77	107.77	113.12	116.18	118.44	122.92	122.95	135.04	135.17	135.17	135.17
32	Pacific Coast River Plate Brazil-A	93.21	93.21	94.52	100.00	100.00	100.00	100.00	100.00	102.33	103.47	109.27	120.33	120.33	120.33	120.33	125.13	125.13	125.13	125.13
34	Pacific Indonesia	91.87	91.87	91.87	91.87	91.87	100.00	100.00	100.00	106.94	106.94	106.94	118.46	118.46	118.46	118.46	151.74	151.74	150.91	147.33
35	Pacific Straits	77.36	81.29	81.29	85.49	84.10	95.54	95.54	100.00	104.01	104.01	104.01	113.80	113.80	113.80	124.54	141.72	143.46	143.46	143.46
36	Pacific Westbound	83.00	86.25	87.14	93.06	95.60	95.59	95.68	100.00	102.20	102.20	102.20	107.52	110.29	109.74	108.52	112.77	112.82	112.89	112.91
44	Pacific-India	90.82	90.82	90.82	100.00	100.00	100.00	100.00	100.00	128.11	154.68	154.68	154.68	154.68	175.52	175.52	175.52	175.52	175.52	175.52
45	Western Canada-Europe	84.32	90.29	90.29	91.46	99.43	99.86	100.00	100.00	105.11	107.75	107.80	107.80	116.17	116.15	121.40	132.55	134.10	134.11	138.78
50	Canada/India	91.84	91.84	92.49	92.49	90.74	99.24	99.24	100.00	105.72	131.63	142.06	142.06	143.04	143.11	143.25	-	-	-	-
69	Cavn/Saguenay Joint-Venezuelan	75.05	75.05	75.05	75.05	75.05	86.90	97.93	100.00	101.13	110.37	115.90	116.63	116.63	128.08	132.37	132.37	132.37	132.37	132.37
	Overall Price Index	82.43	84.54	84.92	88.62	91.51	94.59	95.39	100.00	103.03	107.06	108.19	112.74	115.58	117.66	119.25	124.09	125.86	126.68	128.32

Table 8.3

QUATERLY LINER FREIGHT RATE INDICES BY CONFERENCE

Commodity Rates and BAF and CAF
(1st Quarter 1980 = 100)

CTC No.	Conference	1978 II	1978 III	1978 IV	1979 I	1979 II	1979 III	1979 IV	1980 I	1980 II	1980 III	1980 IV	1981 I	1981 II	1981 III	1981 IV	1982 I	1982 II	1982 III	1982 IV
01	American West African	72.72	76.72	76.81	75.09	80.29	93.45	96.34	100.00	103.04	108.84	112.09	118.36	129.03	143.20	138.14	146.68	149.39	150.52	149.49
04	Canada/Mediterranean	72.75	75.81	79.55	80.58	90.91	94.02	96.85	100.00	102.86	106.17	108.34	116.46	121.28	120.85	122.03	123.26	123.35	128.07	128.76
06	Canada/United Kingdom	69.12	69.76	69.77	78.61	84.83	90.20	88.83	100.00	97.14	106.54	112.74	125.51	116.87	109.33	106.41	109.96	106.64	107.54	97.05
07	Canadian Continental Eastbound	68.25	70.08	71.55	76.85	81.38	91.32	92.65	100.00	93.89	99.21	103.88	110.46	105.05	100.02	97.47	94.67	94.20	95.11	87.44
15	East Canada/Japan	64.96	72.08	78.35	81.14	86.85	90.46	89.83	100.00	100.61	102.21	108.22	119.12	126.10	119.99	113.96	120.39	123.95	127.50	124.13
17	Eastern Canada/ Australia and New Zealand	70.01	70.01	70.01	74.82	82.83	88.86	96.84	100.00	103.87	105.00	108.19	119.53	119.14	124.27	129.67	138.62	137.75	137.75	138.34
20	Inter-American-A	66.01	69.65	71.31	75.08	84.90	88.61	95.33	100.00	99.97	99.64	101.78	114.53	119.05	120.47	116.28	117.04	120.07	120.41	119.01
26	Latin American/ Pacific Coast	74.19	81.00	82.42	85.00	85.70	95.15	96.22	100.00	101.12	110.96	116.38	123.14	125.08	133.70	130.66	127.67	130.23	134.03	135.07
30	Pacific Coast Australian	61.36	64.74	64.82	66.47	73.27	82.84	85.45	100.00	106.58	105.88	114.84	120.86	124.24	125.92	122.05	130.72	133.48	133.87	132.55
32	Pacific Coast River Plate Brazil-A	82.43	86.96	88.17	90.74	92.96	94.88	95.39	100.00	102.09	102.79	110.76	123.75	124.85	126.34	122.87	125.44	127.96	128.33	127.06
34	Pacific Indonesia	75.28	79.43	79.52	81.93	82.62	96.99	97.53	100.00	105.06	104.72	109.41	124.19	126.15	125.80	110.15	132.03	134.69	134.35	129.86
35	Pacific Straits	64.69	71.72	71.81	77.40	85.54	93.15	93.66	100.00	102.55	101.72	105.41	118.68	120.66	120.80	117.84	126.64	130.77	131.16	129.86
36	Pacific Westbound	70.17	80.10	86.76	88.24	98.35	96.40	95.15	100.00	99.60	99.67	106.34	115.20	121.11	117.47	104.77	104.48	104.37	103.94	101.41
44	Pacific-India	75.60	79.76	79.86	87.22	91.11	96.99	97.54	100.00	109.31	108.95	112.69	118.92	122.54	135.85	131.19	129.58	131.34	131.73	130.42
45	Western Canada-Europe	63.91	68.41	71.63	83.08	94.24	97.30	98.73	100.00	106.32	107.39	107.86	108.96	113.75	107.53	104.42	107.15	106.84	107.21	108.09
50	Canada/India	77.38	77.38	77.84	77.38	86.04	99.44	99.44	100.00	104.09	112.44	114.80	119.99	123.81	121.86	123.75	-	-	-	-
69	Cavn/Saguenay Joint-Venezuelan	64.78	68.35	68.43	72.94	73.63	82.31	95.89	100.00	100.88	108.04	116.17	119.86	124.69	131.54	128.01	126.43	110.53	110.86	109.76
	Overall Price Index	67.71	71.73	74.20	80.17	87.86	92.90	94.27	100.00	101.38	104.50	108.73	116.11	118.20	115.43	111.16	112.78	112.25	113.16	110.37

totals of commodity rates and bunker surcharges shows little increase during these two years.

Secondly, conferences faced strong competition from non-conference lines on major trade routes. As a consequence, several affected conferences not only cancelled their annual general rate increase (GRI) on commodity rates, but also reduced rates for certain highly competitive liner cargos in 1982. Overall, on average, the conferences' basic commodity rate increased 8.5% in 1982 over 1981 due mainly to the incorporation of surcharges, but the total liner rate decreased by about 3%.

The rate level of individual conferences is greatly affected by the competition in the liner markets. In particular, rates on the North Atlantic and the Transpacific routes were depressed. In the last quarter of 1982, the rate levels of the Canada-United Kingdom and the Canadian Continental Eastbound conferences were lower than the rate levels in the first quarter of 1980. Moreover, it is noted that the drop in rates of the Canada-U.K. Conference was less severe than the Canadian Continental Eastbound Freight Conference. This may be attributed to the fact that the major outsider on the Canadian Atlantic route, namely Cast, did not have a direct call in the U.K., but rather used a transshipment service from European ports to serve the U.K. markets. Thus, there was less competition between conference and non-conference lines in the Canada-U.K. trade than the Canada-Continental Europe trade. As shown in Table 8.2, the liner freight indices by conference constructed based on commodity rates alone, the Canada-U.K. conference managed to raise the commodity rates substantially in 1981 and maintained the high level rates in 1982, while the rates to Europe declined from the peak rate level of 1981, even after incorporating surcharges into the commodity rates.

Competition forced the rate level of the Pacific Westbound Freight Conference down to the level of the first quarter of 1980 at the end of 1982. Also, the Western Canada-Europe Freight Conference, had, more or less, operated at the same rate level throughout the three-year period from 1980 to 1982.

Conversely, the conferences, which did not face the same degree of competition as those on main North Atlantic and Pacific trade routes, were able to maintain the upward trend in freight rates throughout the five years studied. For example, American West African, Eastern Canada/Australian and New Zealand, and Pacific Coast Australian freight conferences, etc., all achieved substantially higher than average conference rate increases during this period.

However, generally speaking, in 1982, conference rates were depressed as there were small quarterly rate increases. Where rate adjustments did occur, in most cases, they were downward movements.

8.2 Comparison Between Inbound and Outbound Rates

The disparity in the level of ocean freight rates between inbound and outbound cargos has been a common concern among shippers and governments, especially where the nation relies on the liner services of foreign-dominated conferences. The questions often raised are whether the liner rates are discriminatory against the importers or exporters of a particular country, and whether the pricing policy of ocean carriers adversely affects the nation's foreign trade and the balance of payments. For instance, the U.S. government has conducted a series of congressional hearings and investigations on the issue of the higher liner rates charged on U.S. exports relative to rates on imports.

In 1965, based on a statistical analysis of data on rates and volumes on the U.S. North Atlantic routes, specifically, from U.S. to British and Irish ports, the Federal Maritime Commission (FMC), concluded that "in this particular trade American exporters were not only paying more than their fair share of the round trip costs of transportation, but in fact were subsidizing foreign exporters to this country".[38] These comments were rebutted by the British government and several maritime economists, notably, Bennathan and Walters.[39]

Essentially, the critics of the FMC study point out that the differences in levels between inbound and outbound rates can be influenced by several economic factors. Firstly, the demand and the supply conditions on each leg of the route may be different. Liner carriers may face more tramp competition on one leg of the route than the other. Moreover, on an imbalanced trade route, the capacity utilizations or load factors on inbound and outbound voyages are affected by the different demand levels. Secondly, since the conference's rate structure is, to a certain extent, based on value-of-service pricing, the relatively higher rates for U.S. exports were due to high-value U.S. products rather than a result of deliberate rate discrimination against American exporters. Thirdly, the profitability of liner carriers must be assessed on a round-voyage basis because of the joint costs incurred in a voyage.

However, in 1981, the FMC confirmed that the conference pricing behaviour was responsive to the supply and demand conditions in the liner markets. In particular, a study was undertaken by the FMC to investigate a proposed rate increase in the U.S. North Atlantic eastbound tariff in the middle of 1980 when there were great reductions in the westbound rates. The FMC report found that the demand for liner services in the inbound trade was weak while the demand for space, outbound to Europe, was so strong as to exceed the entire supply. Consequently, it concluded that there were "strong and compelling economic reasons for the inbound and outbound conferences' rate actions".[40]

American exporters and the U.S. government have expressed concerns over the relative inbound and outbound rate levels on the North Atlantic route mainly because the route is served by foreign-dominated conferences and because the rate outbound is generally higher than rate inbound. Since Canada also relies on foreign-flag liner operators in international trades, it is highly desirable to assess from time to time the rate differentials between inbound and outbound liner services. Because no existing work was found, we have undertaken the task and performed statistical comparisons between the inbound and the outbound rate levels on the Canadian North Atlantic routes. The data and the methodology used, and the results are presented below.

The data on freight rates were obtained from the tariffs of four conferences serving Canadian trades to and from the United Kingdom and continental Europe, respectively. These freight rates are those included in the rate structure models as the dependent variables. As described in Section 6.1, the commodity rates were selected based on cargos identified in the shipping manifest records. Comparisons between inbound and outbound rates are performed separately on data from December 1982 and January 1983 in order to reflect relative rate levels before and after the North Atlantic rate reform described in Chapter 4.

Generally speaking, the inbound and outbound traffic mixes are quite different. As commodity groups were identified at the three digit SCC code level, the commodity items found in the inbound and outbound tariffs may not be the same, although the same commodity group may appear in both inbound and outbound vessel voyages. Therefore, instead of comparing rates of individual commodity items, we adopted a statistical method of test about variances and differences of means to compare the relative levels of inbound and outbound rates and to determine if the rate differentials are indeed significant.

The method we used is described in the book entitled Probability and Statistical Influence by Hogg and Tanis.[44] We assume that the outbound rates (X) and the inbound rates (Y) are independent and normally distributed; that the distributions of X and Y are $N(u_x,\delta^2)$ and $N(u_y,\delta^2)$, respectively. We would like to test the hypothesis $H_0: u_x - u_y = 0$ against the alternative hypothesis $H_1: u_x - u_y < 0$. Specifically, the first hypothesis assumes that the inbound and outbound rates are at the same level; the second, or the alternative assumption, is that outbound rates are lower than inbound rates.

If the random samples of sizes n and m are taken, the test can be based on the statistic,

$$T=\frac{\overline{X}-\overline{Y}}{\sqrt{\frac{(n-1)Sx^2+(m-1)Sy^2}{(n+m-2)}\left(\frac{1}{n}+\frac{1}{m}\right)}}$$

which has a t distribution with $r=n+m-2$ degrees of freedom when H_0 is true. The hypothesis H_0 will be rejected in favour of H_1 if the observed value of t is less than $-t_\alpha(n+m-2)$ where α represents the critical level.

The results of the rate comparisons between the outbound and inbound conference tariffs to and from the United Kingdom are presented below:

(1) 1982 Commodity Rates

$UKOUT$: $\overline{X}=118.51 \quad Sx^2=3253.39 \quad n=78$

$UKIN$: $\overline{Y}=146.44 \quad Sy^2=6894.66 \quad m=78$

$Test\ Ho \Rightarrow \overline{X}=\overline{Y} \quad H_1 \Rightarrow \overline{X}<\overline{Y}$

$$Since\ t=\frac{-27.93}{\sqrt{130.1033}}=-2.449<-2.358=-t_{.01}(154)$$

H_0 is rejected at an α =0.01 significance level. Specifically, there is reason to believe that rates for inbound commodities from the U.K. are higher than those for outbound commodities to the U.K. at the 99% significance level.

(2) 1983 Commodity Box Rates for 20 Foot Containers

$UKOUT$: $\overline{X}=1693.33 \quad Sx^2=290146 \quad n=69$

$UKIN$: $\overline{Y}=2758.58 \quad Sy^2=3361881 \quad m=66$

$t=-4.623<-2.617=-t_{.005}(133)$

The above results indicate that rates for inbound 20 foot containers have a larger variance than outbound 20 foot container rates, and that inbound rates are significantly higher than outbound rates at the 99.5% confidence level.

(3) 1983 Commodity Box Rates for 40 Foot Containers

UKOUT: $\overline{X}=3349.29 \quad Sx^2=1781227 \quad n=21$

UKIN: $\overline{Y}=3631.67 \quad Sy^2=1255499 \quad m=21$

$t=-.743<-.681=-t_{.25}(40)$

Rates for 40 foot containers from the U.K. are higher than those for 40 foot outbound containers at the 75% significance level. The result also indicates that the rate differential between inbound and outbound containers is more significant for 20 foot than 40 foot containers.

The above rate analysis is also applied on the tariffs of the Canadian Continental Eastbound and the Continental Canadian Westbound freight conferences. The results are shown below.

(4) 1982 Commodity Rates

CEOUT: $\overline{X}=109.27 \quad Sx^2=1065.39 \quad n=82$

CEIN: $\overline{Y}=144.35 \quad Sy^2=6647.99 \quad m=82$

$t=-3.497<-2.617=-t_{.005}(162)$

The results of the test show that rates for imports from continental Europe are higher than those for Canadian exports to Europe, which can be said are at 99.5% significance level. It is also noted that the variance of inbound rates is much greater than that of outbound rates.

(5) 1983 Commodity Box Rates for 20 Foot Containers

CEOUT: $\overline{X}=1856.16 \quad Sx^2=342194 \quad n=73$

CEIN: $\overline{Y}=2128.43 \quad Sy^2=4691372 \quad m=69$

$t=-1.035<-.677=-t_{.25}(140)$

Again, a wide range of dispersion is shown in inbound 20 foot CBRs which is higher than the average level of outbound CBRs at a 75% significance level.

(6) 1983 Commodity Box Rates for 40 Foot Containers

$CEOUT$: $\overline{X}=3323.86 \quad Sx^2=2599807 \quad n=28$

$CEIN$: $\overline{Y}=4853.57 \quad Sy^2=25634540 \quad m=28$

$t=-1.523<-1.296=-t_{.1}(54)$

On the Canada-Continental Europe trade route, the commodity box rates for 40 foot containers inbound are higher than rates outbound at a 90% confidence interval.

In conclusion, the results of comparisons between inbound and outbound rates on the Canadian North Atlantic trade routes show that the disparity in inbound and outbound rates is statistically significant, and that the inbound rates are higher than outbound rates. This is the reverse of the findings by FMC on the liner costs of U.S. North Atlantic trades, where outbound rates were found higher than inbound rates. However, the discrepancy can be explained by the differences in characteristics between Canada-Europe and United States-Europe trades. First, generally speaking the unit values of Canadian exports to Europe are lower than the values of imports from Europe. Second, during the period from 1982 to 1983, the inbound cargo was abundant; there was no overcapacity in the westbound direction. Whereas, outbound to Europe, the demand for ship space was weak as a result of the fall in the volume of Canadian exports. Therefore, the recent market conditions in Canadian liner trade are opposite to those that affected the U.S. North Atlantic rate structure in 1981. Consequently, the findings in our inbound and outbound rate analysis are consistent with the conclusion reached by the FMC in their comparable analysis. In particular, the differences in inbound and outbound rates are the result of different traffic mixes and different supply and demand conditions in the liner markets.

Moreover, although in Canada-Europe trades the inbound rates are found to be higher than outbound rates in terms of actual freight rate levels, there is reason to believe that in terms of relative freight-value ratios, the effect of liner costs on the prices of Canadian exports may be more significant than the effect on imports because the average unit value of the export is lower than that of the import. Therefore, in the following section, the relative liner costs of selected inbound and outbound commodities on the North Atlantic routes will be examined based on an analysis of freight incidences.

8.3 Incidence of Liner Freight Rates

The incidence of a freight rate is defined as the percentage of the price of a commodity at the destination point that is accounted for by freight charges. As transportation costs represent value added to goods shipped, the concept of freight incidence is important in evaluating the impact of freight rates on the final prices of commodities as well as in estimating the price elasticity of demand for transport services.

It is desirable to calculate liner freight incidences for Canadian import and export commodities because the freight incidence is useful in evaluating the impact of ocean freight rates on Canadian trades. The data on freight rates and values of commodities were collected for the earlier liner index study as well as for the rate structure analysis of this study.

In this study, the price of a commodity at delivery is assumed to be the sum of the liner freight cost and the Free on Board (F.O.B.) value of the commodity. Due to the lack of data, insurance costs, customs duties, and transport costs beyond the port of destination are excluded from the delivered price of a commodity. Consequently, the liner freight rate incidences presented here are expected to be somewhat higher than the ratio of the freight over the final price of a commodity.

Two separate sets of liner freight incidences are calculated based on 1980 and 1982 data, respectively. Based on the 1982 data, comparisons of liner freight incidences between inbound and outbound commodities are made in Tables 8.4 and 8.5 for the Canada-U.K. and Canada-Continental Europe trades, respectively. The freight rates and unit values of selected commodities were obtained from the same sources as that used in the rate structure models (Chapter 6).

Table 8.4 compares the freight incidences of a total of 76 commodity groups (at the three-digit SCC code level) which contain both import and export commodities in the Canada and U.K. trades. Overall, it appears that in a majority of commodity groups, the incidence of freight rates on Canadian exports is higher than that on imports. On average, the incidence of liner rate on the inbound commodity is 7.6% and it is 11.2% on the average value of the outbound commodity. Therefore, the increase in liner rates will have a greater effect on Canadian exports than imports in terms of percentage increases of commodity prices.

Table 8.5 compares the freight incidences between imports and exports of 50 commodity groups in the Canada-Continental Europe trades. Although, it was found in the preceding section that inbound liner rates were higher than outbound rates, the average freight incidence in the two legs of the route appear almost identical; specifically, it is 8.3%

Table 8.4

COMPARISON OF FREIGHT INCIDENCES BETWEEN INBOUND AND OUTBOUND COMMODITIES IN CANADA-U.K. TRADE
1982

OBS	SCC		F.I. Inbound %	F.I. Outbound %
1	31	Fish, whole (round) or dressed, fresh or chilled	4.29	40.24
2	39	Fish, canned	9.06	11.34
3	46	Molluscs and crustaceans (shell fish)	1.53	2.89
4	51	Milk powder (whole and skim milk)	5.92	1.26
5	55	Honey	2.38	4.79
6	61	Barley, seed	13.48	34.82
7	64	Other bakery products	5.68	5.91
8	65	Macaroni products	19.47	5.77
9	71	Fruits and berries, fresh or chilled	16.44	28.56
10	72	Fruits and berries, frozen	11.76	10.90
11	74	Fruit juices, unfermented (exc. concentrated)	6.17	19.30
12	78	Fruits, berries and products, canned (exc. infant)	2.73	5.60
13	91	Potatoes, table fresh or chilled	15.00	38.29
14	93	Vegetables, dried	10.22	26.66
15	95	Vegetables and prep., canned (exc. infant)	9.87	7.71
16	87	Pickles, sauces, dress and other cond. (exc. spices)	9.16	11.75
17	101	Sugar, raw, beet	11.39	7.48
18	104	Sugar preparations (inc. confectionery)	8.64	4.52
19	114	Spices (include spice seeds)	3.38	46.82
20	142	Infant and junior food	1.86	3.93
21	183	Tobacco products, manufactured	0.77	0.69
22	201	Raw hides and skins (exc. fur skins)	16.61	8.93
23	211	Other seeds for sowing	1.04	6.03
24	217	Natural gums and resins (exc. rubber and allied gums)	3.23	3.18
25	242	Wool and fine animal hair suitable for spinning	2.74	4.36
26	246	Man-made fibres, waste and cigarette tow	5.49	9.93
27	272	Bentonite	53.06	53.15
28	291	Textile rags and waste, n.e.s.	3.29	22.85
29	351	Newsprint	9.14	10.78
30	354	Wrapping, packaging and related paper	10.94	12.41
31	356	Paper board	23.39	16.59
32	357	Building paper and board	10.55	15.33
33	359	Converted paper	9.69	4.50
34	365	Continuous man-made fibre yarn	1.03	4.65
35	368	Thread	0.29	3.01
36	369	Cordage, twine and rope (exc. braided cords and threads)	1.61	1.23
37	370	Broad woven fabrics all or in part wool or hair	0.53	0.46
38	371	Broad woven fabrics wholly or in part cotton	0.72	2.71
39	373	Broad woven fabrics, man-made fibre	0.96	1.47
40	381	Special construction fabrics	0.93	1.53
41	383	Narrow fabrics	0.56	1.21
42	399	Other gum, wood and vegetable extracts	18.63	56.56
43	400	Carbon black, flannel or thermal	2.02	6.14
44	401	Sulphuric acid (inc. oleum)	23.36	31.69
45	402	Sodium hydroxide (caustic soda)	3.04	1.43
46	404	Metallic salts and peroxysalts of inorganic acids	5.42	17.47
47	406	Benzene (Benzol)	4.85	19.06
48	407	Glycol	8.94	13.01
49	408	Phenols, ethers, aldehydes, ketones and their derivatives	11.68	3.30
50	409	Organic acids and their derivatives	6.19	8.97
51	411	Nitrogen - function compounds	4.99	9.08
52	413	Other organic chemicals	0.69	1.01

....cont'd.

Table 8.4 cont'd.

OBS	SCC		F.I. Inbound %	F.I. Outbound %
53	416	Ammonium nitrogen - phosphate fertilizers, n.e.s.	19.47	21.25
54	417	Agricultural chemicals, formulated	7.06	1.69
55	421	Adhesives (inc. starch and dextrin base adhesives)	6.19	3.62
56	423	Plastic materials, not shaped	2.00	8.68
57	425	Plastics, basic shapes and forms	1.03	4.04
58	426	Dyestuffs and dye intermediates (E)	1.88	3.50
59	427	Pigments, colour lakes and toners (ex)	6.00	3.50
60	429	Other chemical specialties, industrial	5.98	7.31
61	433	Lubricating oils and greases	11.28	6.59
62	441	Ferro - alloys	9.07	25.84
63	442	Pig iron, basic	6.45	11.83
64	443	Castings and forgings, iron and steel (exec.)	4.47	6.76
65	444	Bars and rods, steel	9.97	17.41
66	445	Plate, sheet and strip, steel	14.01	11.51
67	446	Structural shapes and sheet piling, steel	18.56	7.16
68	448	Pipes and tubes, iron and steel	7.31	19.34
69	449	Wire and rope, steel	11.31	3.02
70	451	Aluminium and aluminium alloys	3.66	1.79
71	452	Copper and copper alloys	3.76	2.10
72	453	Lead and lead alloys	4.97	6.39
73	457	Zinc and zinc alloys	4.69	4.30
74	459	Other non-ferrous base metals and alloys	0.53	2.63
75	467	Welding electrodes (rods) and welding wire	2.90	1.31
76	581	Passenger automobiles and chassis	0.89	1.40
		Average Freight Incidence	7.61	11.24

Table 8.5

COMPARISON OF FREIGHT INCIDENCES BETWEEN INBOUND AND OUTBOUND COMMODITIES IN CANADA-EUROPE TRADE
1982

OBS	SCC		F.I. Inbound %	F.I. Outbound %
1	11	Meat (exc. poultry), fresh, chilled or frozen	2.45	3.32
2	31	Fish, whole (round) or dressed, fresh or chilled	6.74	7.48
3	39	Fish, canned	10.40	2.30
4	46	Molluscs and crustaceans (shell fish)	7.64	3.40
5	51	Milk powder (whole or skim milk)	15.65	11.12
6	55	Honey	1.44	3.79
7	61	Barley, seed	7.04	39.09
8	78	Fruits, berries and products, canned (exc. infant)	7.48	7.51
9	91	Potatoes, table fresh or chilled	16.03	8.61
10	93	Vegetables, dried	3.82	19.32
11	95	Vegetables and prep., canned (exc. infant)	12.84	9.05
12	97	Pickles, sauces, dress and other cond. (exc. spice)	11.02	6.67
13	104	Sugar preparations (inc. confectionery)	15.46	2.41
14	112	Coffee	5.06	1.25
15	113	Tea	5.80	1.17
16	114	Spices (inc. spice seeds)	3.83	5.09
17	171	Non-alcoholic beverages	7.81	11.27
18	183	Tobacco products, manufactured	1.56	0.87
19	201	Raw hides and skins (exc. fur skins)	8.94	4.30
20	205	Feathers, quills, bristles and human hair	2.00	0.17
21	211	Other seeds for sowing	5.88	7.45
22	212	Copra	10.25	25.26
23	242	Wool and fine animal hair suitable for spinning	1.05	4.76
24	252	Bauxite ore	12.91	16.20
25	272	Ben Tonite	31.68	55.05
26	351	Newsprint	13.88	12.22
27	356	Paper board	16.19	19.23
28	365	Continuous man-made fibre yarn	0.73	3.16
29	368	Thread	0.76	5.16
30	369	Cordage, twine and rope (exc. braided cords and threads)	0.87	3.47
31	371	Broad woven fabrics wholly or in part cotton	0.78	1.90
32	373	Broad woven fabrics, man-made fibre	0.78	0.78
33	381	Special construction fabrics	0.59	2.84
34	402	Sodium hydroxide (caustic soda), dry	15.94	10.72
35	404	Metallic salts and peroxysalts of inorganic acids	11.50	13.07
36	421	Adhesives (inc. starch and dextrin base adhesives)	3.19	4.98
37	422	Synthetic rubber (inc. rubber comp. and reclaimed)	3.41	10.89
38	425	Plastic basic shapes and forms	4.66	2.93
39	433	Lubricating oils and greases	7.11	3.89
40	443	Castings and forgings, iron and steel (exc.)	21.04	3.12
41	444	Bars and rods, steel	9.93	11.13
42	445	Plate, sheet and strip, steel	19.09	23.07
43	446	Structural shapes and sheet piling, steel	20.21	5.96
44	448	Pipes and tubes, iron and steel	18.13	2.62
45	449	Wire and rope, steel	10.45	3.29
46	451	Aluminium and aluminium alloys	5.17	3.29
47	452	Copper and copper alloys	3.91	2.15
48	453	Lead and lead alloys	4.39	3.17
49	457	Zinc and zinc alloys	6.48	4.45
50	459	Other non-ferrous base metals and alloys	1.49	1.54
		Average Freight Incidence	8.31	8.35

inbound and 8.4% outbound. Thus, the in terms of freight-value ratios, the liner freight cost affects the prices of exports as much as it affects import prices.

The 1980 data include 341 selected commodity rates of 17 outbound conferences, with breakdowns of rate components, such as basic commodity rates, rates including bunker, and currency surcharges, etc. Therefore, it not only faciliates an assessment of the impact of the overall liner cost on Canadian export prices, but it also makes it possible to evaluate the effect of bunker and currency surcharges on the prices of commodities in Canadian export trades.

The major findings based on the analysis of liner freight incidences in the 1980 export trade are summarized below:

Overall, it is found that on average, in 1980 Canadian export trades, liner rates constitute 15.6% of the unit values of commodities at destination; the average incidence of liner rates on commodities exported from the East Coast is 12% and from the West Coast it is 23%.

Comparisons of liner rate incidence between different commodities on a particular route, and between different routes of a selected commodity are also obtainable. For example, three summary tables (8.6, 8.7, and 8.8) are included and analysed.

1) Table 8.6 shows liner freight incidence, with and without surcharges, of selected export commodities in the 1980 Canada-U.K. trade. Several points can be made from the table. First, there exists a wide range of freight incidences among commodities; specifically, the liner costs account for 1 - 37% of the value of commodities on the North Atlantic route. Second, evidence on value-of-service pricing can be obtained from the table. For example, the freight incidences of zinc blocks and copper refinery shapes are both around 6%; however, the liner rate per 1 000 kg is $54.91 for zinc and $192.08 for copper. Another case of value-of-service pricing can be established by examining the value-rate relationship of man-made fibres and polyethelene in Table 8.6. Third, sudden increases in liner rates, such as those caused by BAFs and CAFs have a more significant effect on a low-value commodity than on a high-value commodity in terms of the percentage increase in the price of the commodity, although the latter bear higher surcharges in absolute terms.

Table 8.6

LINER FREIGHT INCIDENCES OF SELECTED COMMODITY EXPORTS FROM EASTERN CANADA TO UNITED KINGDOM 1980

K.C.C. Codes	Commodity Description	F.O.B. Value/m.t. $	Liner Rates/m.t. $		Freight Incidence %	
			Basic Rates	Overall Rates*	Basic Rates	Overall Rates*
3727	Herring fillets frozen	1 488.87	177.87	232.03	10.67	13.48
3912	Cod blocks and slabs frozen	1 874.27	177.87	232.03	8.67	11.02
4442	Salmon, pink, canned	5 042.04	67.13	91.58	1.49	1.78
4443	Salmon, sockeye, canned	7 969.57	67.13	91.58	.84	1.14
4649	Shrimps, fresh or frozen	8 914.16	237.35	307.33	2.59	3.33
5114	Cheese, Cheddar	3 999.00	89.44	119.67	2.19	2.91
7103	Apples and crab-apples	538.84	66.39	90.66	10.97	14.40
9309	White pea beans, dried	515.08	62.38	85.52	10.80	14.24
9550	Corn canned	1 120.03	52.25	72.64	4.46	6.09
15660	Fish meal, n.e.s.	434.43	53.85	74.76	11.03	14.68
18210	Tobacco	4 894.44	67.96	92.58	1.37	1.86
27120	Asbestos, grp. 3	1 274.51	38.89	55.72	2.96	4.19
27130	Asbestos, grp. 4 and 5	791.15	38.89	55.72	4.69	6.58
27140	Asbestos, grp. 6 and 7	251.67	36.67	52.90	14.53	19.70
33879	Plywood, soft n.e.s.	300.65	133.75	176.07	30.79	36.93
34019	Woodpulp	628.64	54.25	75.17	7.94	10.68
35109	Newsprint paper	578.71	64.25	87.84	9.97	13.18
35149	Printing paper, n.e.s.	315.00	73.25	99.23	18.87	23.96
35439	Wrap paper	475.82	66.25	90.37	12.22	15.96
35610	Liner board	507.24	66.25	90.37	11.55	15.12
35619	Container paper, n.e.s.	439.66	66.25	90.37	13.09	17.14
36639	Nylon yarn	3 136.81	94.25	125.93	2.91	3.86
36699	Man-made fibres	3 679.41	180.50	235.36	4.68	6.01
37790	Woven fabrics	6 793.90	92.13	123.29	1.34	1.78
42316	Polyethelene resins	1 126.59	58.67	80.81	4.95	6.69
42399	Plastic and syn. rubber	1 309.02	80.00	107.91	6.11	7.61
42499	Plastic sheet	2 421.31	66.60	90.92	2.68	3.62
44450	Wire rods, steel	430.91	39.83	56.93	8.46	11.67
44555	Sheet and strip steel	359.95	47.50	66.62	11.66	15.62
45109	Aluminium pigs	1 904.09	46.75	65.67	2.40	3.33
45204	Copper rfny. shapes	2 604.95	146.37	192.08	5.32	6.87
45309	Lead pigs	1 115.79	38.25	54.91	3.34	4.69
45708	Zinc blocks	814.12	38.25	54.91	4.48	6.32
47619	Fused alumina	467.37	47.75	64.40	8.92	12.11
54372	Combines	5 930.94	83.25	112.03	1.38	1.85

* Rates include bunker surcharges and currency adjustment factors.

Table 8.7

LINER FREIGHT INCIDENCES OF SELECTED COMMODITY CANADA TO JAPAN (PACIFIC WESTBOUND) EXPORT 1980

K.C.C. Codes	Commodity Description	F.O.B. Value/m.t. $	Liner Rates/m.t. $		Freight Incidence %	
			Basic Rates	Overall Rates*	Basic Rates	Overall Rates
1103	Beef, frozen	3 740.63	100.70	123.67	2.62	3.20
1124	Hams, not cooked	4 307.37	267.30	305.92	5.84	6.63
1129	Pork, frozen, n.e.s.	3 992.01	285.96	326.33	6.68	7.55
3327	Herring, frozen, whole	1 234.64	316.29	359.50	20.43	22.59
3341	Salmon, frozen, whole	5 594.90	324.45	368.44	5.48	6.18
3343	Salmon, sockeye, frozen	5 875.64	324.45	368.44	5.23	5.90
3369	Sea Fish, frozen	2 118.20	354.78	401.61	14.35	15.94
4649	Shrimps and prawns, frozen	7 480.00	347.49	393.72	4.44	5.00
4929	Herring roe, frozen, cured	13 505.97	171.66	201.29	1.27	1.47
4930	Salmon roe, fresh, frozen	10 085.73	171.66	201.29	1.67	1.96
15703	Pelleted screening	85.93	57.15	76.04	39.95	46.95
20110	Cattle hides, raw	1 068.44	92.63	114.85	8.02	9.75
21260	Soya beans	315.63	115.28	139.61	26.58	30.48
27130	Asbestos milled fibres, Group 4 and 5	677.57	98.46	121.23	12.69	15.18
27140	Asbestos shorts, Group 6-9 grades	280.34	98.46	121.23	25.99	30.18
33879	Plywood, softwood, n.e.s.	256.99	159.99	188.53	38.37	42.32
34019	Wood pulp dissolving	645.98	102.93	126.12	13.74	16.33
35109	Newsprint paper	500.56	148.33	175.77	22.88	26.01
35439	Wrap paper	535.72	217.15	251.05	28.84	31.91
35610	Liner board	424.99	79.90	100.92	15.82	19.19
40699	Hydrocarbons and derivatives	230.78	182.15	212.77	44.01	47.87
40799	Alcohols and derivatives	242.51	254.47	291.88	51.21	54.63
44139	Ferrosilicon	669.10	183.32	214.05	21.50	24.24
45109	Aluminium pig ingots	1 622.87	61.33	80.61	3.64	4.73

* Rates include bunker surcharges and currency adjustment factors.

For instance, the unit values of printing paper not elsewhere specified (n.e.s.) and woven fabrics were $315 and $6 794, respectively. The liner incidences on printing paper were about 19% before the imposition of BAF and CAF, and 24% after the surcharges, while the liner incidence on woven fabrics only increased 0.44% (from 1.34% to 1.78%) as a result of surcharges.

2) The same points made above with regard to the freight rate incidence on commodities exported on the Canada-U.K. route, can be applied to the West Coast Canada-Japan trade routes. As shown in Table 8.7, on the Pacific route, there is a wide dispersion in freight incidences on selected commodities which ranged from 1.5% to 55% of the price of commodity (i.e., F.O.B. value plus liner cost). However, generally speaking, the liner freight incidences on exports on the Pacific route are higher than those on the North Atlantic route, which can be attributed to the longer distance of the former route. The value-of-service pricing is also discernible from the table, for example, liner rates for carrying three fishery products, namely, herring, salmon, and shrimp were positively related to the values of these three products. It is noted that the commodity, "sea fish, frozen", had the highest liner rate among the selected refrigerated commodities though its unit value was relatively low. However, this is because the general liner rate was used for this commodity due to the lack of specific information on the product. The general rates usually are higher than specific commodity rates in the conference tariffs and are not related to the unit values of commodities. Finally, Table 8.7 also shows that the higher the liner freight incidence is, the more it is affected by surcharges.

(3) Table 8.8 compares liner rates and incidences on the commodity newsprint paper, for different export routes and destinations. As shown in the table, the liner costs account for approximately 12% to 33% of the price of Canadian newsprint papers exported to different countries. Theoretically, the longer the ocean

Table 8.8

35109 - NEWSPRINT PAPERS

LINER RATES AND INCIDENCES BY TRADING ROUTES AND DESTINATIONS
1980

CTC Conf. Code Can. Coast	Destination(s)	F.O.B. Value/m.t. $	Liner Rate/m.t. $		Freight Incidence %	
			Basic Rates	Overall Rates*	Basic Rates	Overall Rates*
04 E	Spain	446.00	88.83	111.26	16.61	19.97
06 E	United Kingdom	578.71	64.25	87.84	9.97	13.18
07 E	Belgium	550.19	67.25	89.78	10.88	14.03
	France	632.64	67.25	85.09	9.61	11.86
	W. Germany	499.55	67.25	91.33	11.86	15.46
	Netherlands	586.16	67.25	90.29	10.29	13.35
15 E	Japan	605.70	60.65	89.07	9.10	12.82
17 E	Australia	401.52	152.67	193.80	27.55	32.55
20 E	Argentina	487.29	103.32	123.26	17.49	20.19
	Brazil	539.83	142.92	180.28	20.93	25.03
	Uruguay	495.31	103.32	123.26	17.26	19.93
26 W	Columbia	460.34	167.89	188.44	26.72	29.05
	Ecuador	443.28	161.69	182.18	26.73	29.13
	Venezuela	478.29	182.25	204.11	27.59	29.91
	Costa Rica	441.11	144.63	165.04	24.69	27.23
	El Salvador	438.76	130.93	151.28	22.98	25.64
	Guatemala	442.70	144.63	165.04	24.63	27.16
	Mexico	381.78	126.26	146.60	24.85	27.75
30 W	Australia	451.50	160.57	193.67	26.23	30.02
32 W	Argentina	410.40	124.51	130.53	23.28	24.13
	Brazil	424.28	190.76	226.59	31.22	34.81
	Uruguay	471.67	124.90	148.19	20.94	23.91
34 W	Indonesia	499.79	101.48	119.30	16.88	19.27
35 W	Malaysia	442.58	151.83	168.94	25.54	27.63
	Singapore	438.76	151.83	168.94	25.71	27.80
36 W	Hong Kong	478.34	143.66	157.68	23.10	24.79
	Japan	500.56	148.33	175.77	22.88	25.99
	Taiwan	445.87	151.83	165.87	25.40	27.11
44 W	India	414.69	178.80	211.48	30.12	33.77
50 E	India	419.70	125.35	161.32	23.00	27.76
69 E	Venezuela	479.15	85.44	106.08	15.13	18.13

* Rates include bunker and currency surcharges.
E= East Coast
W= West Coast

> trading route, the higher the liner costs and freight incidence should be. However, this is not always true, for example, the liner rate for newsprint paper exports to Japan from the East Coast is \$89.07 while from the West Coast it is \$175.77. Conversely, the distance between Halifax and Yokohoma is 10 021 nautical miles versus 4 262 nautical miles between Vancouver and Yokohoma. The lack of a consistent relationship between distance and liner rates may be a consequence of different competitive conditions in liner markets. The East Canada-Japan Freight Conference may have to offer lower rates in order to compete with the Pacific Westbound Conference because the latter offers intermodal service and has the advantage of relatively shorter transit time. In addition, the East Coast Japan Freight Conference is vulnerable to the competition of lines serving U.S. East and South Coasts. Moreover, newsprint paper is known as a target cargo which is subject to strong tramp competition.

It would be desirable to analyse in more detail the difference in liner rates and incidences on a per tonnne-mile basis between different routes. However, it is beyond the scope of this study.

8.4 The Elasticity of Demand for Liner Transport

The demand for liner service is a derived demand. It arises from the demand for import/export commodities in overseas trades. Since under normal circumstances, increases in freight rates would be borne by both shippers and buyers, the demand for shipping, or, in general, for any transport mode, is affected by both the consumers' and the suppliers' responses to changes in the prices of goods. Thus, the elasticity of demand for transportation can be estimated by the following formula:[42]

$$E_{trans} = F \cdot \frac{E_s E_d}{E_s - (1-F) E_d} \qquad (1)$$

Where

E_{trans} = the elasticity of demand for transportation;

F = the incidence of freight rates, i.e., transportation cost as a fraction of final price;

E_s = the elasticity of supply of the commodity shipped $(E_s>0)$;

E_d = the elasticity of demand for the commodity $(E_d<0)$.

The respective effect of elasticities of demand and supply of the commodity on the elasticity of demand for transportation can be examined by taking the limit of E_{trans}. Assume that the limit of E_{trans} is taken as the elasticity of supply of the commodity approaching infinity, then:

(2) $E_{trans} = F \cdot E_d$

on the other hand, if the elasticity of demand is taken as infinite, then:

(3) $E_{trans} = \frac{-t}{P_s} \cdot E_s$

where t/P_s

represents the ratio of transport cost (t) to the F.O.B. Supply price (P_s).

Thus, theoretically, in dealing with the elasticity of demand for liner transport, it is necessary to take into account the price elasticities of demand for imports and exports. Estimates of response of imports and exports to price changes for different countries are presented in a number of studies which are included in an annotated bibliography entitled Price Elasticities in International Trade by Stern, Francis, and Schumacher.[43] For example, Table 8.9 shows estimates of elasticities of imports and exports with respect to demand and relative price for the seven major OECD countries (France, Germany, Italy, U.S., U.K., Canada, and Japan). The estimates were derived by Meyer-Zu-Schlochtern and Yajima in 1970 based on the OECD trade model.

As shown in Table 8.9, the price elasticity of imports and exports of major OECD countries ranged from -0.34 to -1.88 and from -0.33 to -1.25, respectively. Since the freight incidence factors shown in equations (2) and (3) are normally less than one, it can be said that the demand for liner transport is generally inelastic.

Table 8.9

ESTIMATED ELASTICITIES OF IMPORTS AND EXPORTS WITH RESPECT TO INDUSTRIAL PRODUCTION, RELATIVE PRICES, AND MARKET GROWTH

	Imports		Exports	
	Industrial Production	Relative Price	Market Growth	Exports Price
France	1.33	-1.35	1.03	-1.22
Germany	1.64	-0.34	1.23	-0.99
Italy	1.26	-	1.46	-0.99
U.K.	1.61	-	0.57	-0.33
Canada*	0.87	-1.49	0.89	-0.94
U.S.*	1.10	-1.88	0.81	-1.00
Japan	0.82	-0.78	1.97	-1.25
Other OECD	1.40	-	1.12	-

* For the U.S. and Canada, GNP instead of industrial production.

Source: Frans Meyer-zu-Schlochtern and Akira Yajima, 'OECD Trade Model: 1970 Version', *OECD Economic Outlook*, Occasional Studies (Paris: OECD, 1970).

However, due to the lack of disaggregated estimates of the price elasticity of individual commodities, liner operators tend to use the price of a commodity relative to the price of other commodities as an indicator of elasticity of demand for shipping it. The elasticity of demand for transportation is considered inversely related to the value of the commodity, the higher is the value, the lower the elasticity of demand for transportation service, which leads to the value-of-service pricing.

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APPENDIX A

LIST OF NEO-BULK AND BULK COMMODITIES

A. List of Neo-Bulk Commodities

SCC Code	Commodity Description
23100-23199	Logs and bolts
23700-23799	Other road wood untreated
33100-33199	Lumber and sawn timber
33300-33399	Railway ties untreated and other sawmill products
33800-33899	Plywood
47512	Cement, n.e.s.
55100-55199	Tractors
58100-58799	Road motor vehicles
34100-34199	Woodpulp
35109	Newsprint paper

B. List of Bulk Commodities

Liquid Bulk

10170	Molasses
21600-21699	Rubber and allied gums; natural
26210	Crude petroleum
39100-39199	Animal oils and fat (except marine)
39200-39299	Fish and marine animal oils
39325	Soya bean oil; crude
39399	Mixtures of vegetable oils with other oils
40115	Sulphuric acid (incl. oleum)

40207	Sodium hydroxide (caustic soda); liquid
43100-43199	Gasoline
43200-43299	Fuel oil
43300-43399	Lubricating oil and greases
43600-43699	Refined and manufactured gases; fuel type
43939	Tar and pitch, n.e.s.
43999	Petroleum and coal products n.e.s. (ex. those in chemicals)

Dry Bulk

6100-6199	Cereal, grain; unmilled
10102-10103	Sugar; raw, beet, and cane
15233	Hulls; screenings, chaff, and scourings
15262	Wheat bran; shorts and middlings
15399	Oil seed cake and meal; n.e.s.
21226-21299	Oil seeds, oil nuts, and oil kernels
23600-23699	Pulpwood (round wood)
23800-23899	Pulpwood chips
25100-25108	Iron; ore, crude, concentrate
25210	Alumina
25312	Copper in ores and concentrates
25710	Zinc in ores and concentrates
25720	Zinc in dross and ashes
25940	Manganese in ores and concentrates
25970	Titanium in ores, concentrates, and slags
25990	Metal-bearing ores and concentrates
26134	Bituminous coal
27249	Clays; n.e.s., ground or unground

27625	Limestone; rough building stone
27650	Crude stone; n.e.s.
27657-27659	Limestone; n.e.s., crushed
27671	Gravel (incl. gravel mixed with sand)
27940	Gypsum
27961	Rock salt
27965	Phosphate rock
27977	Sulphur; n.e.s., crude, and refined
30110-30199	Upper leather
41652	Potassium choloride
43500-43599	Coke of petroleum and coal